

HDI 5000

Ultrasound System

Getting Started

4708-0027-03 Rev A

April 2000

ATL Ultrasound

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CAUTION

United States federal law restricts this device to sale by
or on the order of a physician.



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ATL Ultrasound products may be manufactured under or operate in accordance with one or more of the following United States patents and corresponding patents in other countries: U.S. Patent Numbers 4,581,636; 4,607,642; 4,543,960; 4,644,795; 4,887,306; 5,016,641; 5,123,415; 5,197,477; 5,255,682; 5,050,610; 5,226,422; 5,275,167; 5,207,225; 5,287,753; 5,215,094; 5,381,795; 5,386,830; 5,402,793; 5,390,674; 5,438,994; 5,471,989; 5,482,045; 5,476,097; 5,471,990; 5,456,257; 5,485,842; 5,482,047; 5,479,930; Re 35,148; 5,555,887; 5,617,863; 5,669,385; 5,645,066; D369,307; 5,634,465; 5,603,323; 5,706,819; 5,715,823; 5,718,229; 5,720,291; 5,879,303; 5,951,478; Re 36,564; 5,980,457; 5,961,462; 5,940,123; 5,908,389; 5,891,035; 5,860,924; 5,795,297; 5,846,200; 5,833,613. Other patent applications are pending in various countries.

Read This First

About Your Manual Set

This manual is part of a manual set. The manual set addresses the reader who is familiar with ultrasound techniques. Sonography training and clinical procedures are not included in the manual set. The manual set includes the following:

- ***Getting Started:*** Introduces you to basic system features and concepts. When you complete the procedures in this manual, you will know how to use these features and understand the concepts of system operation.
- ***Scanheads and Safety:*** Contains information about safety, scanheads, biopsy guides, transesophageal and laparoscopic scanheads, and acoustic output.
- ***Reference Manual:*** Contains information that supports and amplifies the procedures in *Getting Started*. It includes image management, maintenance, troubleshooting, specifications, references, and a glossary.
- ***Using Disinfectants and Gels:*** Contains information about compatible gels and disinfectants and disinfecting ATL products.
- ***Acoustic Output Tables:*** Contains information about mechanical and thermal index precision and accuracy, the acoustic output default tables, and the acoustic output tables.
- ***Medical Ultrasound Safety:*** Contains information about bioeffects and biophysics, prudent use, and implementing ALARA (as low as reasonably achievable).
- ***Operating Notes:*** Contains information that clarifies certain system responses that might be misunderstood or cause user difficulty.

About Your Manual Set on Compact Disc (CD)

A CD is included in a pocket on the inside back cover of the *Getting Started* manual. The CD contains the complete manual set, except for the *Operating Notes*. The instructions for using the CD are on the last page of the *Getting Started* manual.

Please take the time to use the CD, complete the brief survey card included with the manual set, and mail the survey card to us.

Conventions Used in This Manual

These conventions are used in this manual:

- All procedures are numbered. You must complete steps in the sequence they are presented to ensure a reliable result.
- Bulleted lists indicate general information about a particular function or procedure. They do not imply a sequential procedure.
- Control names appear in this manual like they appear on the system.
- Menu items or titles appearing on the display are shown in the manual like they appear on the display.
- The left side of the system is to your left as you stand in front of the system, facing the system.
- Scanheads and pencil probes both are referred to as scanheads, unless the distinction is important to the meaning of the text.
- "Select" means to place the cursor over an item and press **SELECT** once.
- "Double-select" means to place the cursor over an item, and quickly press **SELECT** two times, like double-clicking with a computer mouse. Pressing **SELECT** too slowly on double select will only highlight an item. Pressing it rapidly will initiate an action.

System Conventions

These conventions are used in the system:

- The software that runs the system uses graphic display elements similar to those used in many personal computers. References to these elements in the software or in the manual are defined in the glossary in the *Reference Manual*.
- On a menu, protocol, or other display, a highlight bar indicates that the item or name contained within the boundaries of the highlight bar is in the process of being selected. Pressing the **SELECT** control or other related control actually selects the item, assigns a value to a system parameter, or initiates the action related to the selected item.
- On a menu, an underlined letter indicates that pressing the underlined letter on the system keyboard will have the same effect as choosing the menu item with the track-ball and the **SELECT** control.
- On the system keyboard, pressing the **Superkey** and another designated key, for example 2D Maps, allows you to change a system parameter without using a menu. Using the Superkey is a quick way to change a system parameter that normally appears on a menu.

Read This First

- Pressing a key or control the first time initiates a mode change, function, or operation, or changes the value of a system parameter. Pressing the same key or control a second time resumes a previous mode or system parameter, cycles to the next setting, or ends the function or operation. All **MENU** controls work this way, and it can be quicker to press the **MENU** control than to select **Close**, especially to exit a submenu.
- On a menu, protocol, or other display, text that is lighter in color than the other text on the display indicates that the item or name contained within the boundaries is not available for selection in that menu, protocol, or display.
 - A or indicates an option or alternative for selection.
 - A or indicates that an option or alternative has been selected.
- Selecting **Close** from a menu or display removes the menu or display from the screen.
- Selecting + or - increases or decreases the value of the parameter.
- An ellipsis ... on a menu indicates that a submenu is available from the selection.
- To highlight a menu, protocol, or other display item, use the trackball to move the cursor to the particular item.
- To enter text into a text field, use the keyboard.
- The softkeys, located on the lower right of the control panel, assume functions based on your control selections. For example, pressing **VCR CTRL** results in the softkeys assuming these VCR control functions: **PLAY**, **PAUSE**, **STOP**, **FF** (Fast Forward), and **REWIND**.

System Upgrades and Manual Set Updates

ATL Ultrasound is committed to innovation and continued improvement. Upgrades may be announced that consist of hardware or software improvements. Updated manuals will accompany those system upgrades.

Customer Comments

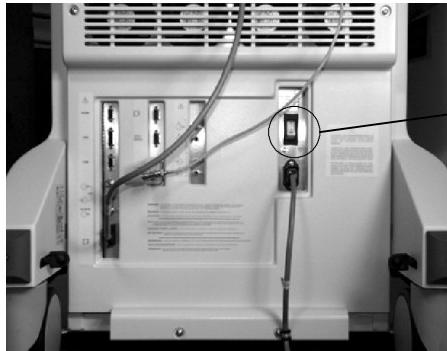
If you have questions about the manual set, or you discover an error in the manual set, please call the ATL Customer Service at (800) 433-3246; or if you are outside the USA, call the nearest ATL office, listed later in this section. You can also send electronic mail (e-mail) to ATL Technical Publications at the following address:

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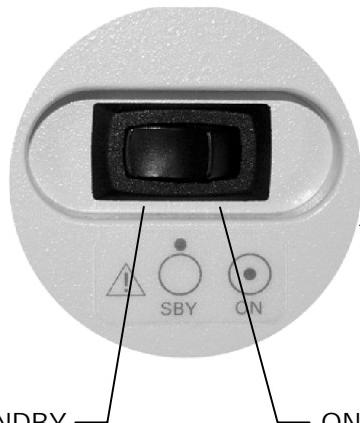
Starting an Exam

- " To prepare the system for operation:

1. Ensure that the circuit breaker on the rear of the system (Figure 2-1) is set to **OFF**.
 2. Ensure that the **ON/STANDBY** switch is set to **STANDBY** (Figure 2-1).
-



Circuit breaker



ON/STANDBY switch



Figure 2-1. System Circuit Breaker and ON/STANDBY Switch Locations

Starting an Exam

3. Plug the system power cord into a grounded outlet, rated for at least 15 amperes. Systems used in North America should only be connected to hospital-grade outlets.
 4. Connect a scanhead to one of the scanhead receptacles ([Figure 2-2](#)).
 - a. Position the scanhead connector against the scanhead receptacle.
 - b. Turn the locking lever clockwise.
- " To connect the footswitch assembly:
1. Locate the footswitch connector on the front of the system ([Figure 2-2](#)).
 2. Connect the footswitch assembly to the footswitch connector.
- " To connect physio transducers:
1. Prepare the ECG leads, phono, pulse, and auxiliary transducers, as necessary.
 2. Connect the ECG, physio, and auxiliary connectors, as necessary, to the system receptacles ([Figure 2-2](#)).

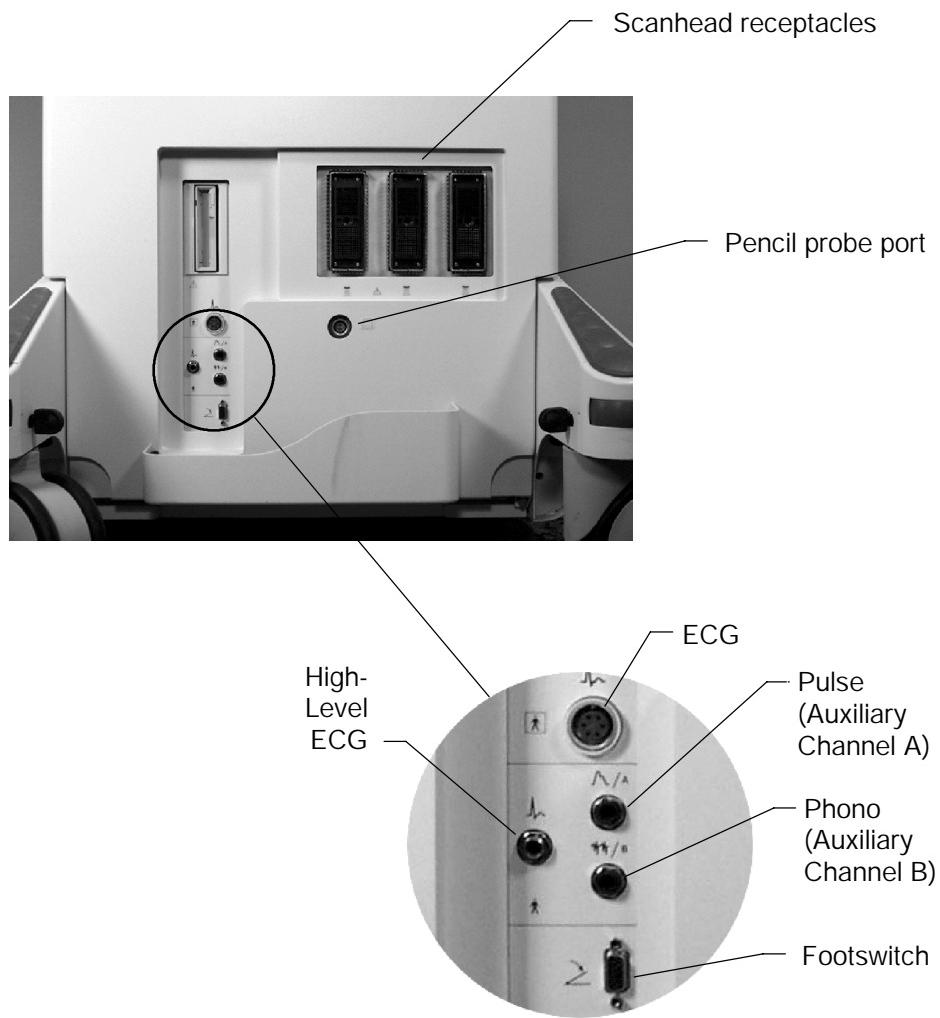


Figure 2-2. Connection Receptacles

Starting an Exam

" To turn on power to the system:

1. On the rear of the system, switch the circuit breaker switch to **ON** ([Figure 2-1](#)).
 2. On the left side of the system, switch the **ON/STANDBY** switch ([Figure 2-1](#)) to **ON**.
 3. Wait about one minute while the system performs its initialization and self-test routine. A 2D display appears on the video monitor ([Figure 2-3](#)). (If a pencil probe is the only scanhead connected to the system, a scrolling display appears on the video monitor.)
-

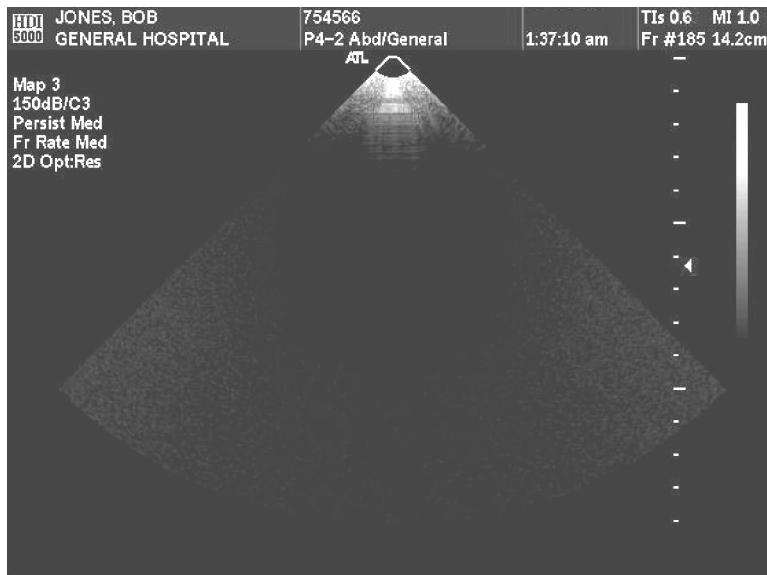


Figure 2-3. 2D Display

" To turn off power to the system:

1. On the left side of the system, switch the **ON/STANDBY** switch to **STANDBY** ([Figure 2-1](#)).
2. The system displays a message, "Initiating power-down...Will power down when finished saving files." and then the system shuts down.
3. On the rear of the system, switch the circuit breaker ([Figure 2-1](#)) to **OFF**.

CAUTIONS

- S Standby does not result in an immediate cessation of system activity. A power-down sequence occurs, similar to the initialization that occurs when power is turned on. Do not inadvertently cycle power, when this power-down sequence is occurring.
- S To prevent electrical damage to the system or possible loss of patient data, after turning the system off, always wait 5 to 10 seconds before turning the power on again.
- S Prior to disconnecting the power cord from the electrical outlet, switch the circuit breaker to the **OFF** position.

" To enter new patient data:

If you have the Worklist option or the Digital Video Streaming (DVS) option, the procedure for patient data entry differs from the following procedure. Refer to the "Image Management" section of the *Reference Manual*, if your system has the Worklist option. Refer to the "Digital Video Streaming Option" section of the *Reference Manual*, if your system has the DVS option.

1. Press the **Patient Data** key to display the **Patient Data Entry** form (Figure 2-4).

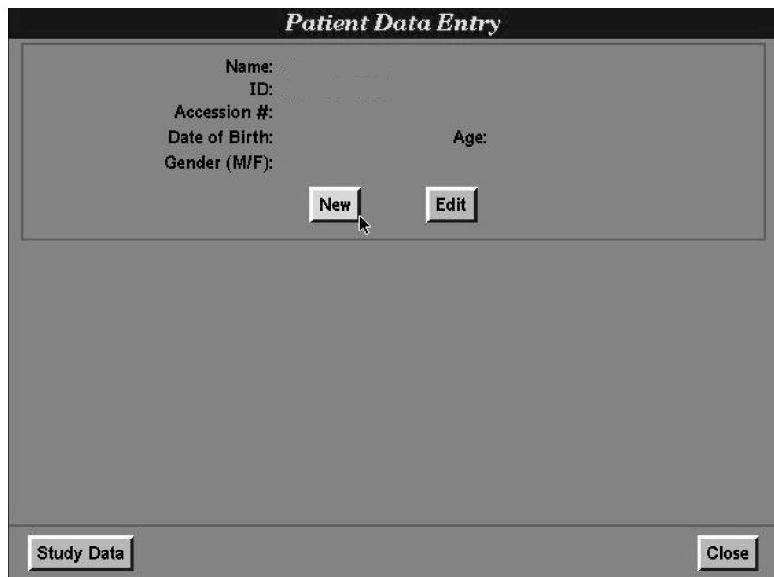


Figure 2-4. Patient Data Entry Form

2. Select **New** to display the **New Patient** form (Figure 2-5).

Patient Data Entry
New Patient

Last Name:
First Name: MI:
ID:
Accession #:
Date of Birth: MM/DD/YY Age: Mos./Days
Gender (M/F):

Entering new patient will clear all current images and report information.
If you do not enter the ID, the system will generate the ID for you.

Figure 2-5. New Patient Form

3. Enter patient information: **Last Name**, **First Name**, **MI** (middle initial), **ID**, **Accession #**, **Date of Birth**, and **Gender**, and press the **Return** key after each entry. **Age** is calculated from the date of birth you enter.
 - With the Image Management option, if you do not enter an ID, the system will generate an ID and assign it to the patient.
 - An accession number is an optional entry assigned to each patient file by an institution for internal information management purposes.
4. Press the **Patient Data** key, or select **Close**, to save the patient information and to exit the display.

" **To edit patient data:**

1. Press the **Patient Data** key to display the **Patient Data Entry** form ([Figure 2-4](#)).
2. Select **Edit** to display the **Edit Patient** form ([Figure 2-6](#)).

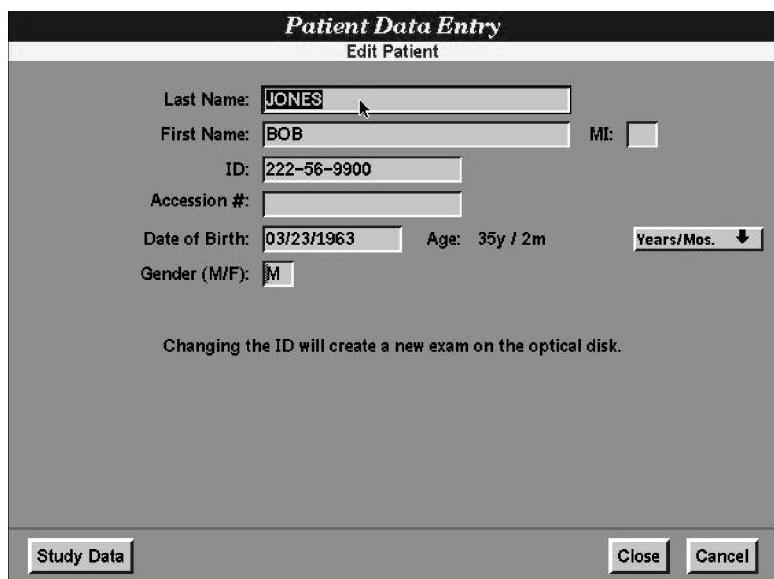


Figure 2-6. Patient Data Entry: Edit Patient Form

3. Edit patient information: **Last Name**, **First Name**, **MI** (middle initial), **ID**, **Accession #**, **Date of Birth**, and **Gender**, and press the **Return** key after completing each field. Age is calculated from the date of birth you enter.
 - With the Image Management option, if you do not enter an ID, the system will generate an ID and assign it to the patient.
 - An accession number is an optional entry assigned to each patient file by an institution for internal information management purposes.
4. Press the **Patient Data** key, or select **Close**, to save the patient information and to exit the display.

Starting an Exam

" To enter study data:

1. Select **Study Data** on the **Patient Data Entry** form to display additional study data fields (Figure 2-7).

The screenshot shows the 'Patient Data Entry' window with the title bar. Below it, patient information is displayed: Name: JONES, BOB, ID: 222-56-9900, Accession #: (empty), Date of Birth: 03/23/1963, Age: 35y / 2m, Gender (M/F): M. There are 'New' and 'Edit' buttons. A 'Study Data' tab is selected, showing fields for Height (0.0, in), Weight (0.0, lb), LMP (MM/DD/YY), Estab. Due Date (MM/DD/YY), and Twins (Y/N) (N). Units dropdowns are shown next to Height and Weight. At the bottom are 'Study Data', 'Prev Exam Data', and 'Close' buttons.

Figure 2-7. Study Data Form

Note Verify that the date and time are accurately displayed. You will need to press the **Patient Data** key to display the time and again to return to **Patient Data Entry**.

2. If necessary, change the units of measure on the **Study Data** form:
 - a. Select the units of measure to display a drop-down list. Units of measure include the following: for height, **cm** (centimeters) and **in** (inches); for weight, **lb** (pounds), **oz** (ounces), **kg** (kilograms), and **gms** (grams).
 - b. From the drop-down list, select the units of measure you want.
3. Enter the patient's height and weight in the units of measure shown on the display. Press the **Return** key after each entry. The patient's body surface area will be calculated and displayed based on the height and weight you entered.
4. If appropriate, enter the **LMP** (last menstrual period) date. Press the **Return** key. The system automatically calculates and displays the gestational age using the LMP date, **GA (LMP)**. A calculation of the estimated date of delivery by the last menstrual period, **EDD (LMP)**, is also calculated and displayed.
 - If the LMP is unknown, you can enter an **Estab. (Established) Due Date** and then press **Return**. The system will calculate an LMP date and designate it with a **c**, for "calculated value."

Starting an Exam

5. Enter the **Estab. Due Date** and press the **Return** key.
6. For **Twins**, enter Y or N (Yes or No) and press the **Return** key.
7. If previous ultrasound exam data exists, select **Prev Exam Data**. The **Previous Exam Data** form is displayed (Figure 2-8).
 - a. Enter the information into the **Previous Exam Data** form. There are 10 exams available, and you should enter the data in chronological order, beginning with **Exam #1**.
 - b. When finished, select **Close** to exit the **Previous Exam Data** form.

The screenshot shows a software window titled "Previous Exam Data". It displays three sets of measurement data side-by-side, labeled "Exam #1", "Exam #2", and "Exam #3". Each set includes a date input field and a table of measurements. The measurements are: BPD (cm), HC (cm), AC (cm), FL (cm), EFW (gm), HC:AC, HUM (cm), and TIB (cm). The "Exam #1" section has a cursor over the date input field. The "Exam #2" and "Exam #3" sections show identical data. At the bottom right are buttons for "Close", "Back", and "Forward".

Previous Exam Data		
Exam #1	Exam #2	Exam #3
Date: MM/DD/YY	Date: MM/DD/YY	Date: MM/DD/YY
BPD 0.00 cm	BPD 0.00 cm	BPD 0.00 cm
HC 0.00 cm	HC 0.00 cm	HC 0.00 cm
AC 0.00 cm	AC 0.00 cm	AC 0.00 cm
FL 0.00 cm	FL 0.00 cm	FL 0.00 cm
EFW 0 gm	EFW 0 gm	EFW 0 gm
HC:AC 0.00	HC:AC 0.00	HC:AC 0.00
HUM 0.00 cm	HUM 0.00 cm	HUM 0.00 cm
TIB 0.00 cm	TIB 0.00 cm	TIB 0.00 cm

Figure 2-8. Previous Exam Data

Starting an Exam

" To select a scanhead for image optimization:

1. Ensure that the desired scanhead is securely connected to the scanhead receptacle.
2. Press the **Scanhead** key to display the **Scanhead** display, which shows the scanheads that are currently connected to the system (Figure 2-9).
3. Select the scanhead that you want. A list of clinical options is displayed based on the scanhead that you select (Figure 2-9).

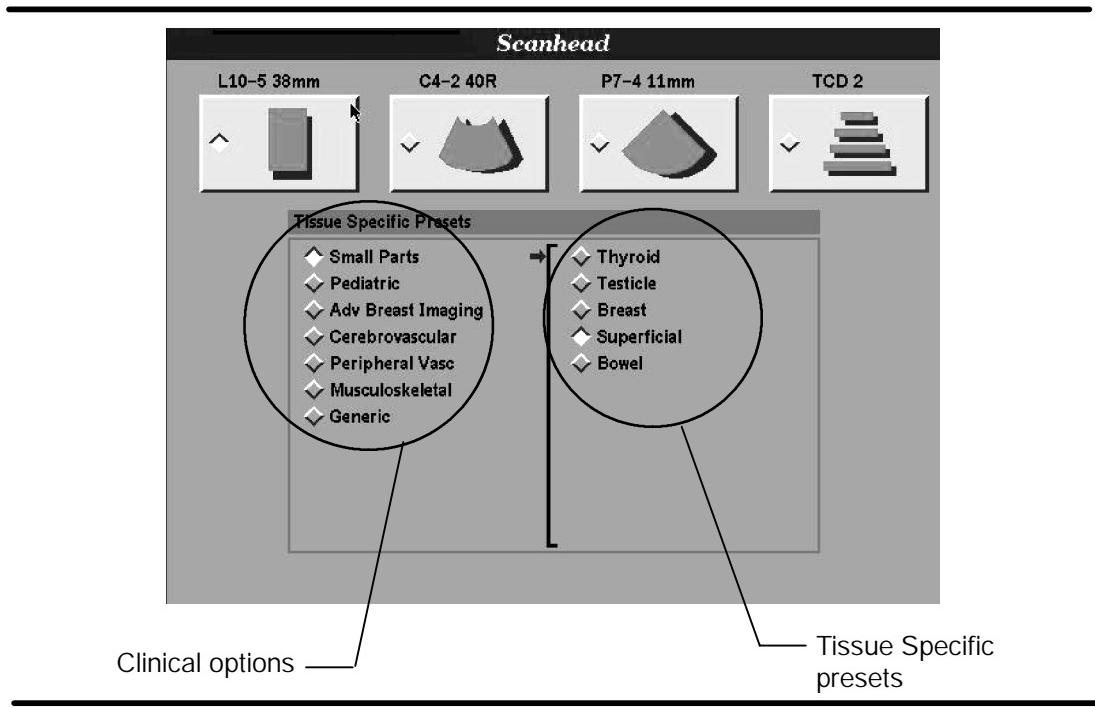


Figure 2-9. Scanhead Display

4. Select the clinical option that you want. A corresponding list of Tissue Specific presets displays across from the list of clinical options (Figure 2-9).
5. Select a Tissue Specific preset. The system initializes with the scanhead, clinical option, and the Tissue Specific preset you have selected (Figure 2-10).

Note If scanhead initialization fails: check the scanhead connector, reselect the scanhead, or select another scanhead.

Starting an Exam

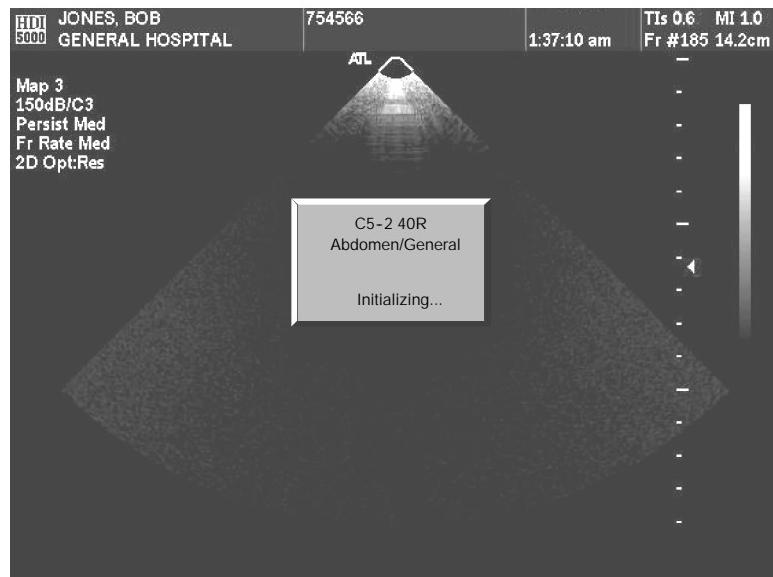


Figure 2-10. Tissue Specific Scanhead Initialization

Using Setups

Setups are system parameters. There are three types of setups: system, Tissue Specific preset, and software. Changing any setup takes effect immediately. System setups are saved through a power cycle. Tissue Specific preset setups are only in effect until the current Tissue Specific preset is changed or a power cycle occurs. Software setups allow you or an ATL representative to install a temporary option on your system. You can use this option for a specified period of time before it is automatically disabled.

Tissue Specific preset setups can be saved as part of a user-defined Tissue Specific preset using the **Quick Save** key.

Image Management and **Acquisition Parameters** setups are addressed in detail in the “Image Management” and “Digital Video Streaming Option” sections of the *Reference Manual*. All setups and settings are explained in the glossary in the *Reference Manual*.

Directory of Setup Options

The **Directory of Setup Options** lists groups of system and Tissue Specific preset setups that are available in the system ([Figure 3-1](#)). Depending upon your system options, the content of your **Directory of Setup Options** may vary.

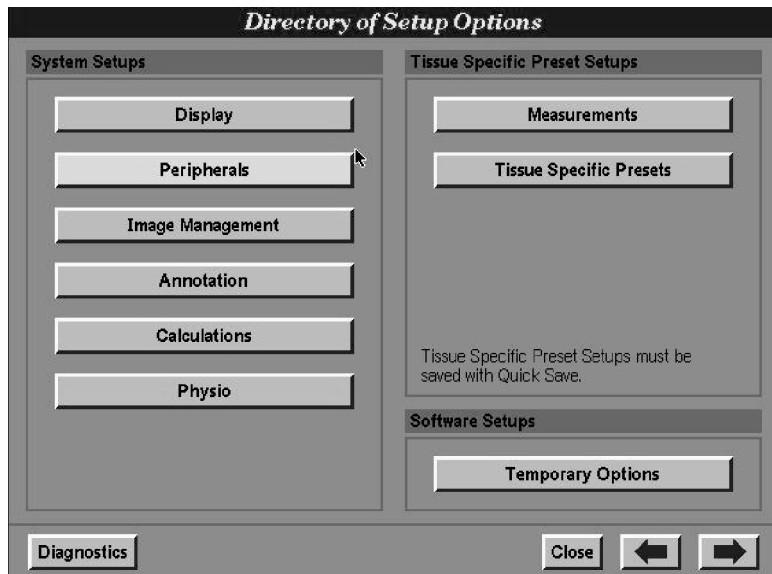


Figure 3-1. Directory of Setup Options (Example)

Using Setups

- " To use the Directory of Setup Options:

1. Press the **Setups** key. The **Directory of Setup Options** appears ([Figure 3-1](#)).
2. Select one of the setup groups listed in the directory. The setups appear.
3. At the bottom of the setups displays, there are several control selections. Select the following, as necessary:
 - **System Defaults**: Having changed setup values, you may want to revert to the original setup values without individually resetting all of the setups. Selecting **System Defaults** allows you to do that. **System Defaults** does not appear on the **Directory of Setup Options**; it appears on the setups displays.
 - **Close**: Closes the display, exits **Setups**, and returns the system to the active imaging mode.
 - **Setups Directory**: Displays the **Directory of Setup Options**.
 - Left arrow: Moves back through the displays of the different setup groups.
 - Right arrow: Moves forward through the displays of the different setup groups.
 - **Diagnostics**: Appears on the **Directory of Setup Options** only; it provides access to the system diagnostics.

System Setups

- " To change setups:

1. Select a setup group from the **Directory of Setup Options**.
2. Select the setup values or enter text into a text field for a setup.
3. Select **Close** or press the **Setups** key.

Perform the examples that follow to become familiar with changing setups, and then use these basic operations to change the range of setups as required for your uses.

Using Setups

" To enter the name of the institution:

1. In **Display** setups, select the **Institution** field in the **Screen Header** area (Figure 3-2). The text entry cursor appears in the **Institution** field.
2. Enter the name of the institution.
3. Select **Close** to exit the **Display** setups and return to the imaging mode. The institution name that you entered appears on the image display.

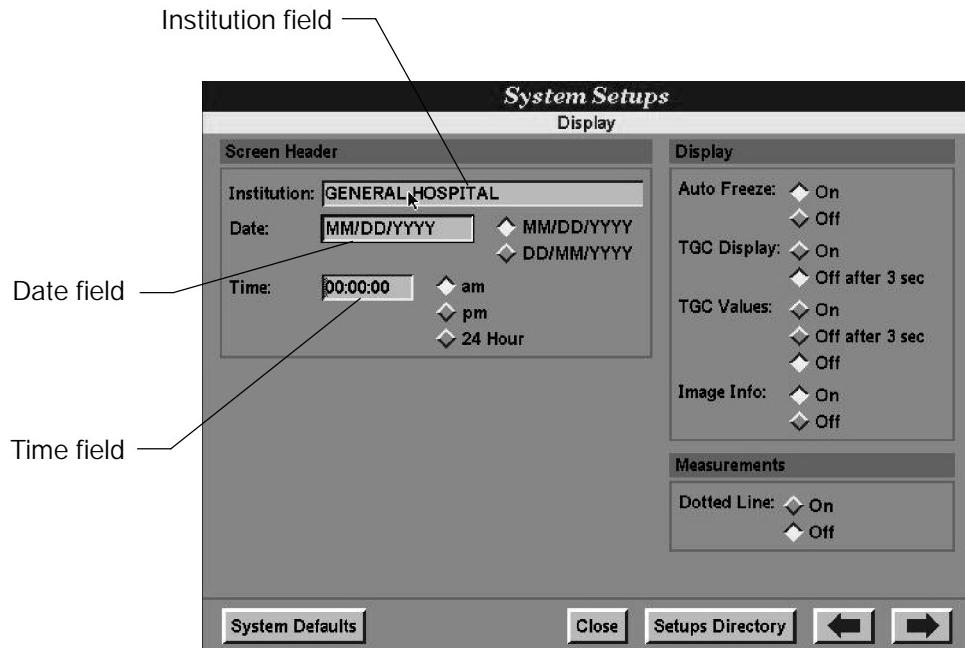


Figure 3-2. Display Setups

Using Setups

- " To enter the date:

1. In **Display** setups, select the desired date format (**MM/DD/YY** or **DD/MM/YY**) in the **Screen Header** area. The diamond changes shading to indicate selection of the date format ([Figure 3-2](#)). When you enter the date, it must correspond in format to this selection.
2. Move the cursor to the left side of the date entry field.
3. Press the **SELECT** control to activate text entry.
4. Enter the date in the format selected.
5. Select **Close** to exit the **Display** setups and return to the imaging mode. The date that you entered appears on the image display.

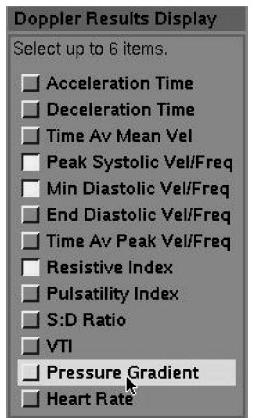
- " To enter the time:

1. In **Display** setups, select the desired time format (**am**, **pm**, or **24 Hour**) in the **Screen Header** area. The diamond changes shading to indicate selection of the time format ([Figure 3-2](#)). When you enter the time, it must correspond in format to this selection.
2. Move the cursor to the time entry field.
3. Press the **SELECT** control to activate text entry.
4. Enter the time in the format selected.
5. Select **Close** to exit the **Display** setups and return to the imaging mode. The time that you entered appears on the image display.

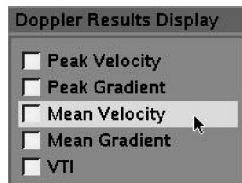
Using Setups

" To set the Doppler results display:

1. On the **Directory of Setup Options**, select **Measurements**. The **Measurements** setups appear.
 2. Select the Doppler result that you want displayed during High Q Doppler analysis (Figure 3-3).
 3. Repeat step 2 until you have selected up to six Doppler results for display (five for Cardiology clinical options).
 4. Select **Close** to exit the **Measurements** setups.
 5. During Doppler imaging, the Doppler results that you select from the **Doppler Results Display** list will be invoked for the number of heart cycles selected in the next procedure.
-



Non-Cardiology



Cardiology

Figure 3-3. Measurements Setups: Doppler Results Displays

Using Setups

- " To set the number of heart cycles by which High Q Doppler analysis will update:
 1. On the **Directory of Setup Options**, select **Measurements**. The **Measurements** setups appear.
 2. Select the **High Q** entry field to activate text entry (Figure 3-4).
 3. Enter the number of heart cycles: the entry must be a number between 1 and 15.
 4. Select **Close** to exit the **Measurements** setups.
 5. The Doppler results will be updated every 1 to 15 heart cycles, depending upon your selection in the **High Q Measurements** setups.

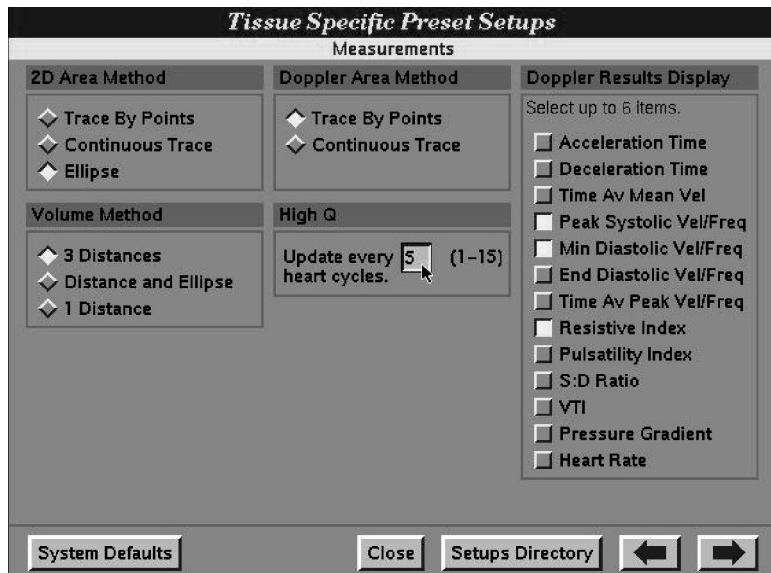


Figure 3-4. Setting the High Q Update Interval

Tissue Specific Preset Sets

Under a preset name, you can save the current setups and system control settings. ATL has optimized several presets and called them Tissue Specific presets. These presets are related to a clinical option and to a scanhead. They set up the system for specific tissue imaging and are intended to reduce the need for control adjustments.

The following procedures deal with creating your own presets, deleting presets, and transferring presets between systems.

" To use the Quick Save key to save a preset:

1. Ensure that the controls and setups are set for your application and scanhead.
2. Press the **Quick Save** key to display the dialog box (Figure 3-5).
3. To clear the **Save current system settings as** field, press the **Backspace** key. (Otherwise, the system default name will be used for your preset.)
4. Enter a name for your preset in the **Save current system settings as** field (Figure 3-5). You can enter five characters.

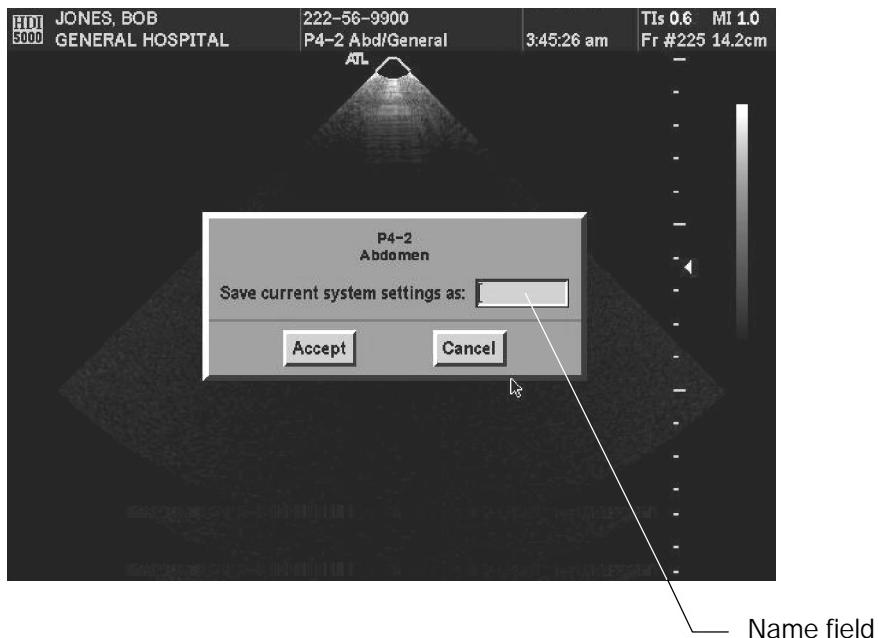


Figure 3-5. Quick Save Dialog Box

Using Setups

5. Select **Accept** to save the preset.
6. To verify that your preset has been saved, press the **Scanhead** key. Your preset appears in the right column of the **Scanhead** display (Figure 3-6). You can now use this preset with the specific scanhead and clinical option.

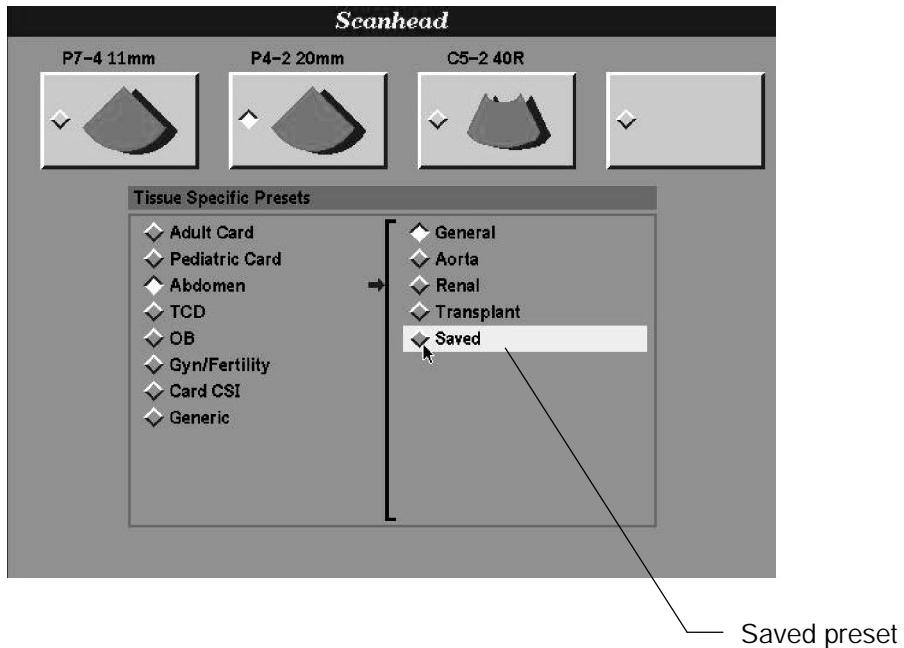


Figure 3-6. User-defined Optimized Preset

Using Setups

" To delete a preset:

1. On the **Directory of Setup Options**, select **Tissue Specific Presets**. The **Tissue Specific Presets Setups** appear. (Figure 3-7).
 2. Select the preset that you want to delete. (ATL Tissue Specific presets cannot be deleted.)
 3. Select **Delete** to delete the selected presets. (Respond to the system dialog box as appropriate.) The custom preset is deleted from the list.
 4. Select **Close** to exit the **Directory of Setup Options**.
-

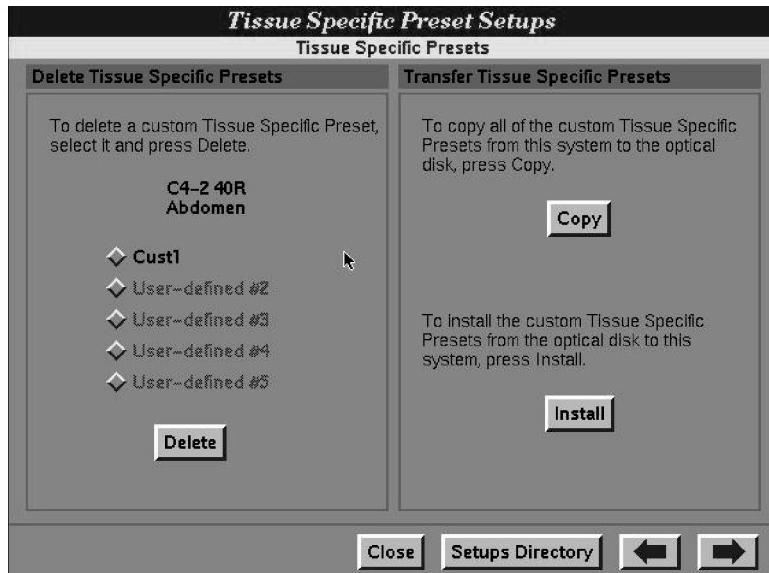


Figure 3-7. Tissue Specific Presets Setups

Using Setups

" To copy presets from a system to an optical disk:

1. On the **Directory of Setup Options**, select **Tissue Specific Presets**. The **Tissue Specific Presets Setups** appear. (Figure 3-7).
2. Insert a formatted optical disk into the disk drive.
3. Select **Copy** to copy the presets to the optical disk. A status message appears, and the indicator on the disk drive lights to indicate that the presets are copying to the optical disk (Figure 3-8).
4. Remove the optical disk:
 - a. Press **NET/DISK**.
 - b. Select **Eject**. The optical disk is ejected from the system optical disk drive.

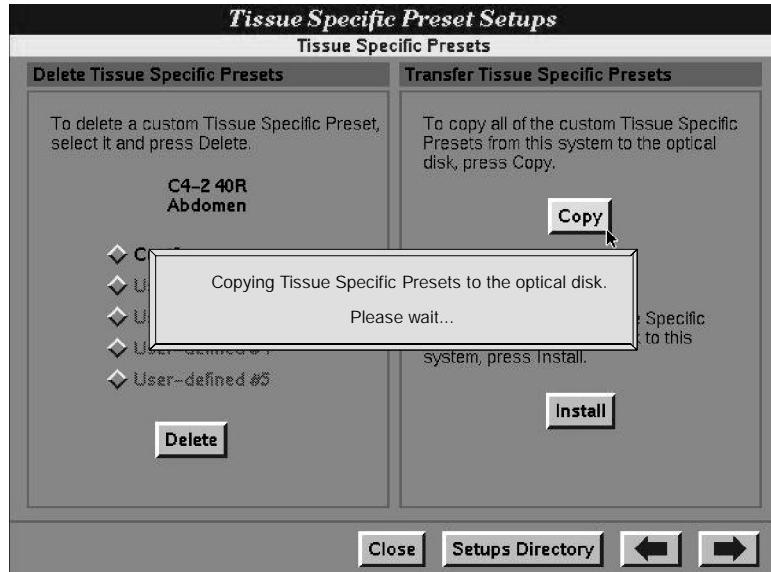


Figure 3-8. Copying Presets Message

Using Setups

- " To transfer presets from an optical disk to the system:

CAUTION

Transferring presets from a system with one version of system software to another system with a different version of system software can corrupt the presets database. This can result in poor system performance. Before transferring presets between systems, ensure that the software versions are the same. Your customer service representative can supply you with this information.

1. On the **Directory of Setup Options**, select **Tissue Specific Presets**. The **Tissue Specific Presets Setups** appear. (Figure 3-7).
2. Insert the formatted optical disk with presets into the optical disk drive.
3. Select **Install** to transfer the presets from the optical disk to the system. The dialog box in Figure 3-9 appears. (Respond to the dialog box as appropriate.)
4. Remove the optical disk:
 - a. Press **NET/DISK**.
 - b. Select **Eject**. The optical disk is ejected from the system optical disk drive.
5. After installing the presets, the list of presets is not automatically updated. You must exit and re-enter the **Tissue Specific Presets Setups** to see the new list of presets.

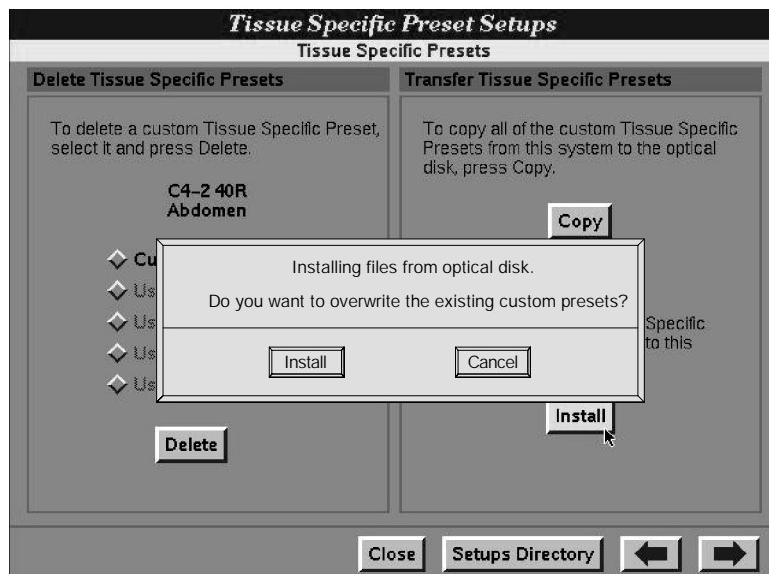


Figure 3-9. Transferring Presets Dialog Box

Software Setups

" To add a temporary option:

1. On the **Directory of Setup Options**, select **Temporary Options**. The **Temporary Options** setups appear (Figure 3-10).
-

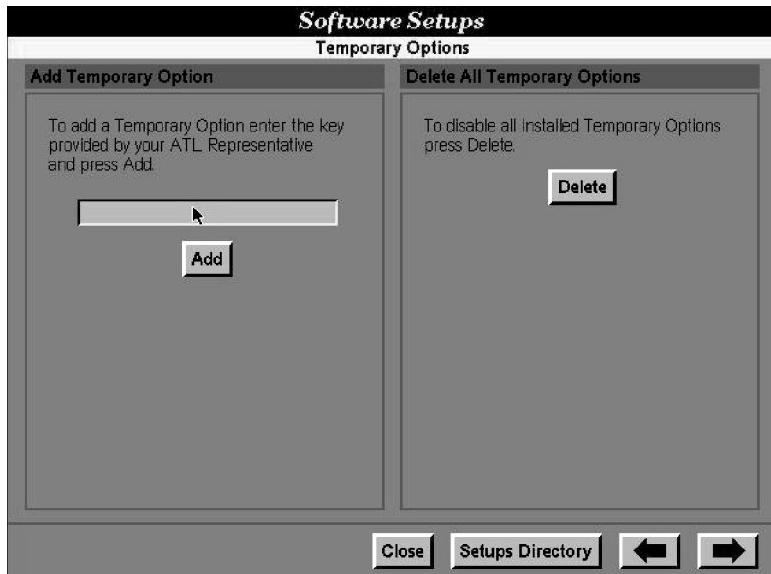


Figure 3-10. Temporary Options Setups

2. Enter the "key" into the text entry field. (You can obtain the key from an ATL representative.)
3. Select **Add**. A dialog box appears describing the temporary software option and how to enable it (Figure 3-11).

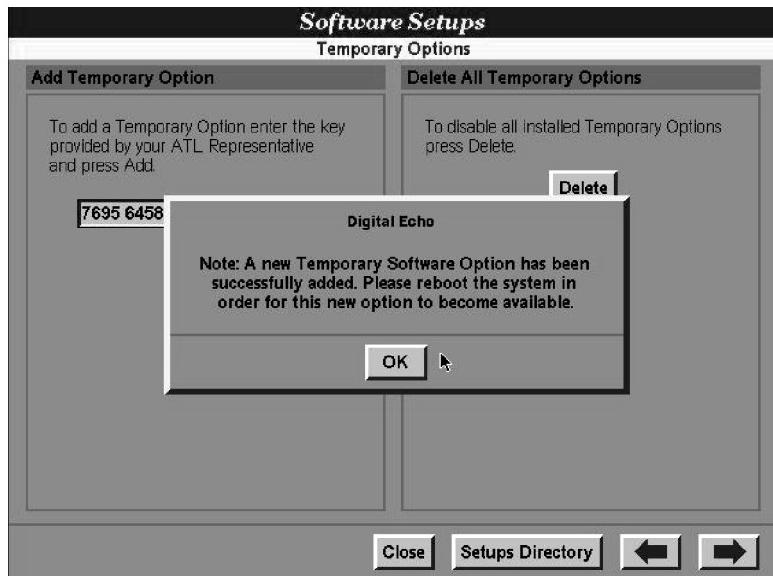


Figure 3-11. Adding a Temporary Software Option Dialog

4. To enable a temporary software option: turn off system power, wait several seconds, and then turn the system on.
 5. When you turn the system on, a dialog box appears, describing the temporary option and the period of time it will remain enabled.
 6. Select **OK**. The dialog is removed and imaging can begin. The temporary option is available for the period of time indicated in the dialog. Each time power is turned on, the dialog will be updated with the time remaining for any additional temporary options.
- " **To delete all temporary options:**
1. On the **Directory of Setup Options**, select **Temporary Options**. The **Temporary Options** setups appear ([Figure 3-10](#)).
 2. Select **Delete**. A dialog box appears, indicating that all temporary software options will be deleted.
 3. Select **OK**. The dialog box is removed.
 4. To update the system software options: turn off system power, wait several seconds, and then turn the system on.

Imaging

The primary imaging controls are on the control panel (Figure 4-1). There are also imaging controls on menus (Figure 4-2). The following procedures describe how to adjust the controls to affect the ultrasound image.

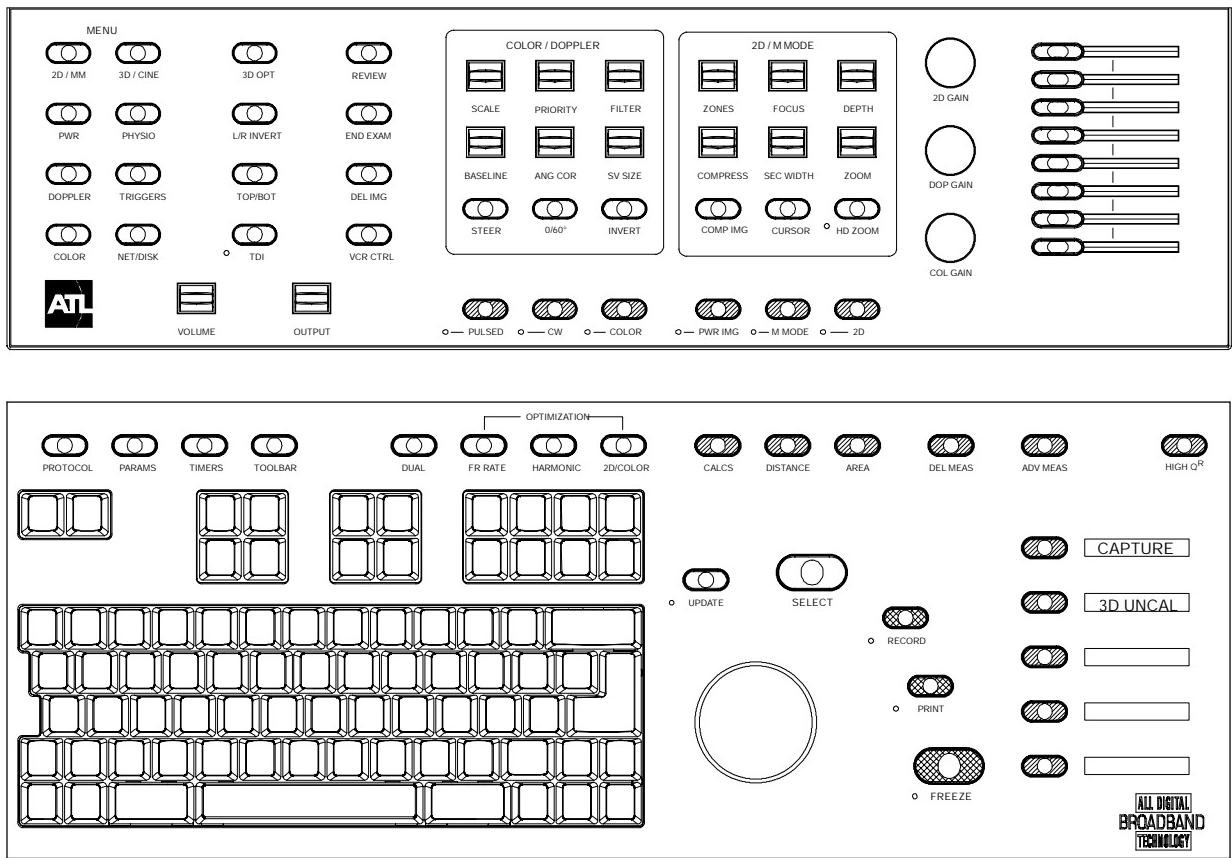


Figure 4-1. Control Panel

" To select an imaging mode:

After initialization, a 2D image appears on the screen. (If a pencil probe is the only scanhead connected, then a scrolling display appears.)

1. To start a different imaging mode, press the **PULSED**, **CW**, **COLOR**, **PWR IMG**, **M MODE**, or **2D** control.
 - In pulsed Doppler, 2D Color, or Color M-mode imaging, you can press the **TDI** control to start Tissue Doppler Imaging.
 - Enable Harmonics or Contrast Specific Imaging by selecting the appropriate Tissue Specific preset.
 - During 2D imaging, press **COMP IMG** to start SonoCT Real-time Compound Imaging (an L12-5 38 mm or 50 mm scanhead must be selected).
2. Press an imaging control a second time to turn off that imaging mode, or press **2D** to return to 2D imaging.

" To use the MENU controls:

1. Press the **MENU** control that is appropriate for your imaging mode.
2. On the menu, select the setting (Figure 4-2). The selection turns on or off, or cycles through the available settings, and the display changes accordingly. If there is a sub-menu associated with the selection (indicated by an ellipsis, ...) then it is displayed.

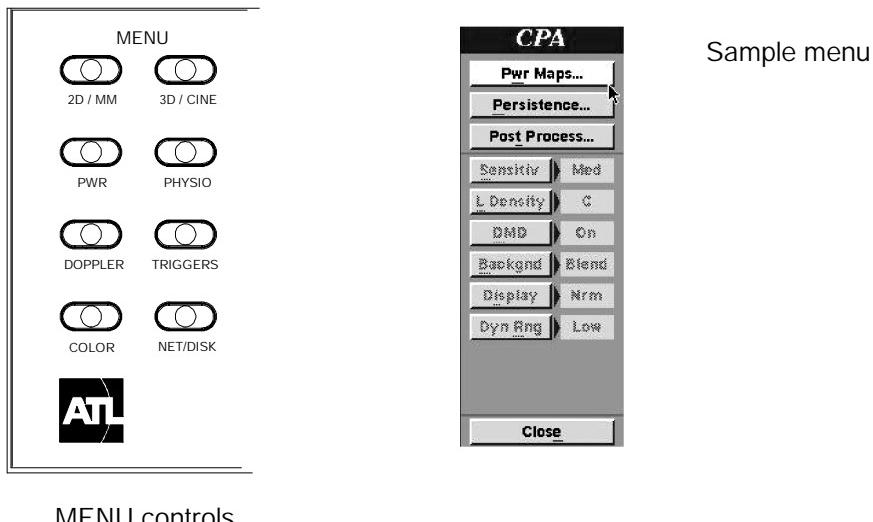


Figure 4-2. Menu Controls

Imaging

- " To adjust GAIN and TGC:

1. Rotate the **2D GAIN**, **COL GAIN**, or **DOP GAIN** control to change the amount of gain that is applied to the overall 2D, Color, or Doppler image. The TGC (time gain compensation) curve will move to reflect the change in 2D gain (Figure 4-3).

Notes S *Display of the TGC curve depends upon the **TGC Display** setting in **Display** set-ups.*

- *The **COL GAIN** control changes gain for the Color image and Power image.*
- 2. Slide a TGC slide control to the left to decrease the amount of TGC applied to the specific area in the 2D image that corresponds to that TGC slide control.
- 3. Slide a TGC slide control to the right to increase the amount of TGC applied to the specific area in the 2D image that corresponds to that TGC slide control.

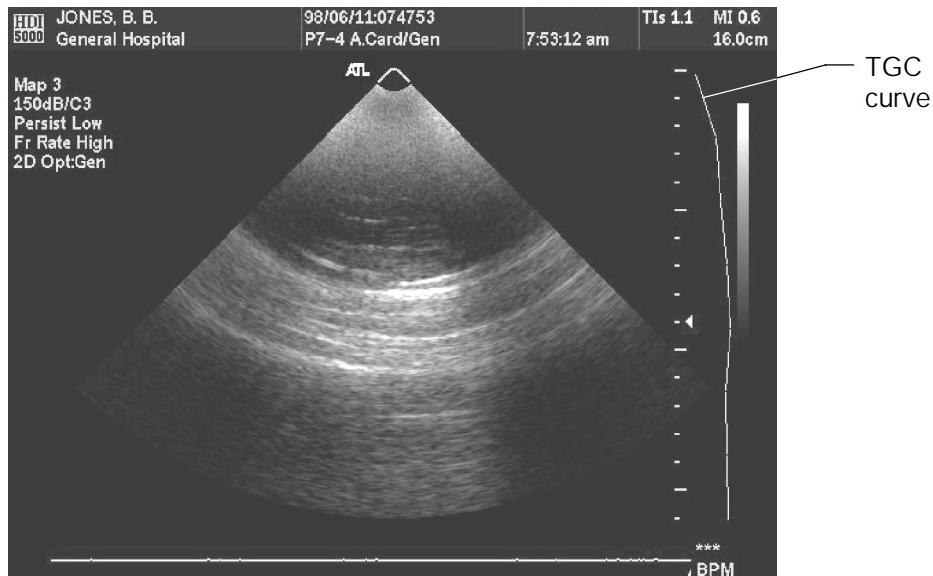


Figure 4-3. TGC Curve

- " To optimize the image for patient specific imaging:

Press the specific **OPTIMIZATION** control (**3D OPT**, **FR RATE**, **HARMONIC**, or **2D/COLOR**) until you have optimized the image for the patient and the imaging mode. The settings available depend upon the clinical option selected. (The **Image Info** display setup turns on or off display of the optimization setting.)

Imaging

" To use SonoCT Real-time Compound Imaging:

1. During 2D imaging, press **COMP IMG**. Compound imaging begins.
 2. Press **FR RATE** to select the scanning geometry that provides the best image quality. **Fr Rate:Surv** and **FrRate:Targ** are the two alternatives (Figure 4-4).
 3. Use the **ZONES** and **FOCUS** controls to adjust the number and location of the focal zones.
 4. Press **COMP IMG** a second time to return to 2D imaging.
-

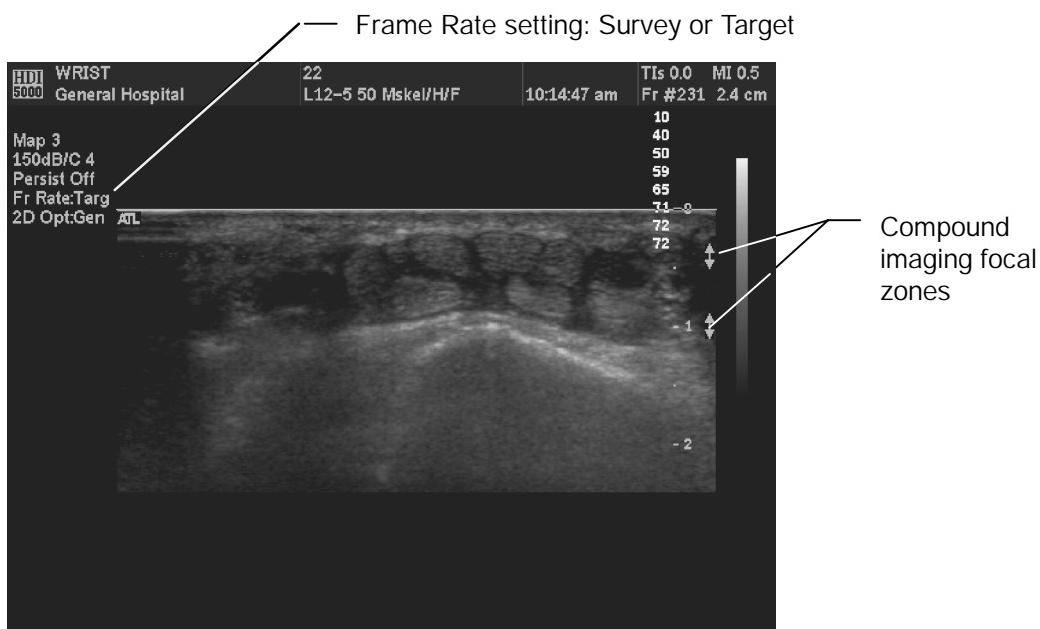


Figure 4-4. Compound Imaging

Imaging

" To adjust OUTPUT:

- Press up on the **OUTPUT** control to increase the acoustic output of the system. The image display and the TI and MI values change to reflect a change in output. (Figure 4-5).
- Press down on the **OUTPUT** control to decrease the acoustic output of the system.
- To change the thermal index display: press the **Superkey** and **TI** key, or select **TIs/TIb** on the **2D/MMode** menu.
- To get more information about the thermal index, press the **TI Help** key.

" To adjust DEPTH:

- Press up on the **DEPTH** control to decrease the display depth of the image. The image, the depth scale, the depth annotation, and the frame rate change to reflect a change in depth (Figure 4-5).
- Press down on the **DEPTH** control to increase the display depth of the image.

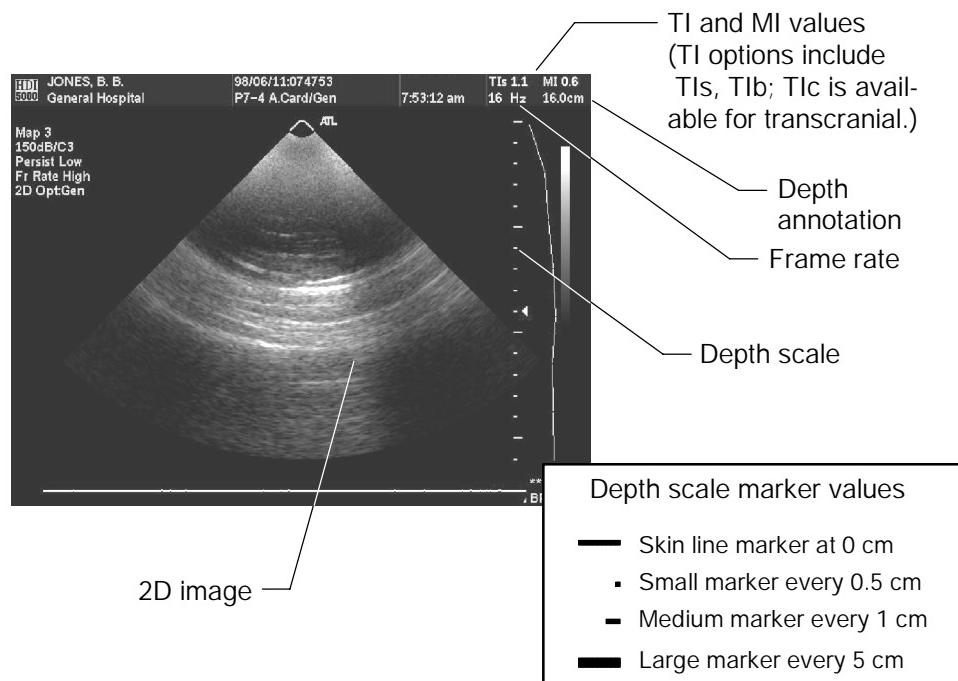


Figure 4-5. Output and Depth Display

- " To change the compression curve:
 - Press up on the **COMPRESS** control to select a different compression curve, increasing the dynamic range. The total system dynamic range available is 150 dB. The compression curve number (Cn) changes to reflect the compression curve selection.
 - Press down on the **COMPRESS** control to select a different compression curve, decreasing the dynamic range.
- " To adjust the focal zone depth and number of focal zones:
 - Press up on the **FOCUS** control to move the focal zone ([Figure 4-6](#)) toward the top of the display, along the depth scale, to the depth of interest.
 - Press down on the **FOCUS** control to move the focal zone toward the bottom of the display.
 - Press up on the **ZONES** control to increase the number of focal zones and change the distance between focal zones.
 - Press down on the **ZONES** control to decrease the number of focal zones and change the distance between focal zones.

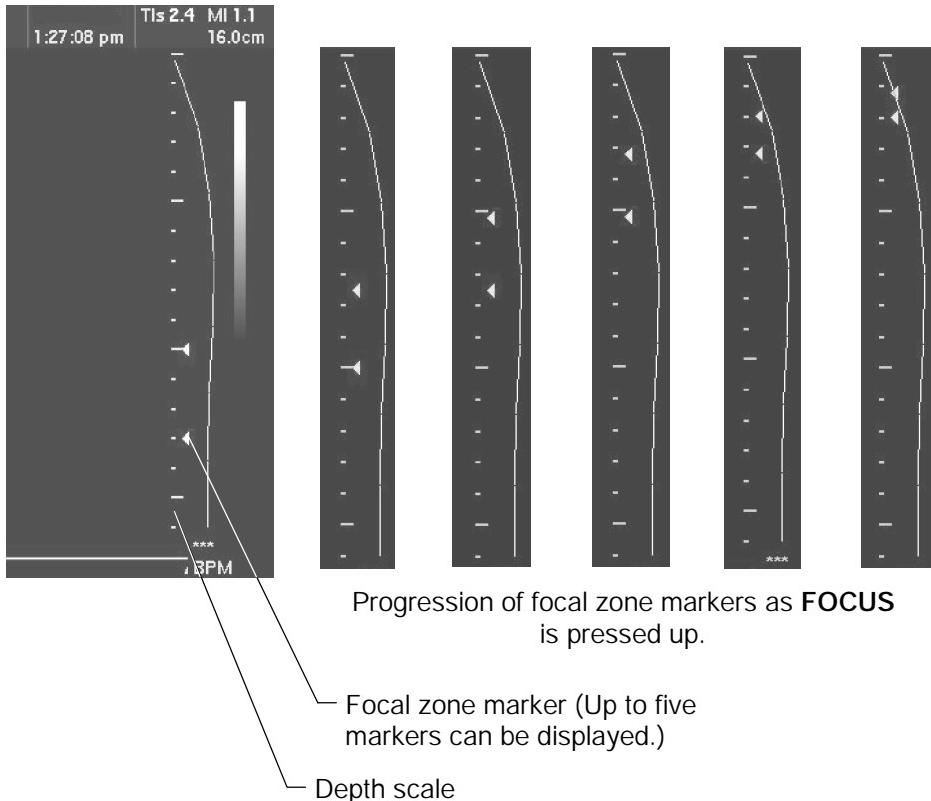


Figure 4-6. Focal Zones

Imaging

" To adjust 2D image orientation:

- Press the **L/R INVERT** control to alternate between left and right image orientation (Figure 4-7).

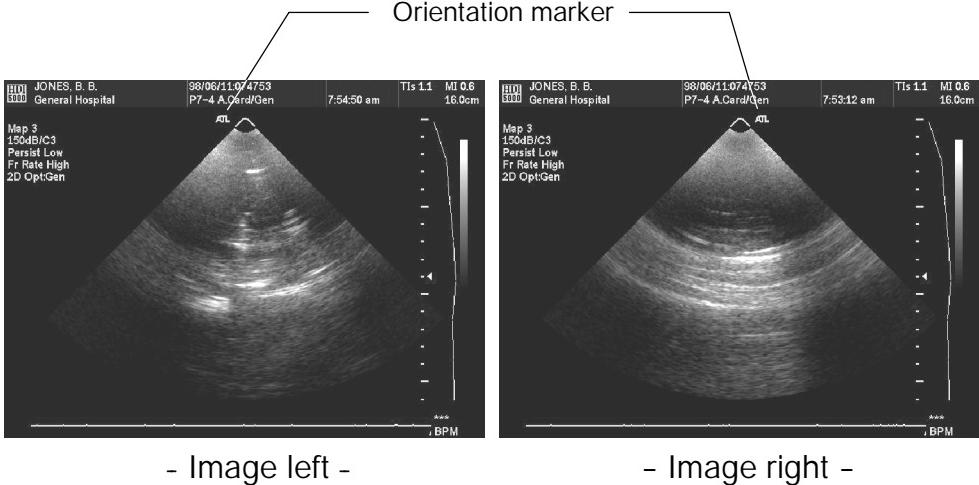


Figure 4-7. 2D Image Orientation (L/R INVERT)

- Press the **TOP/BOT** control up or down to alternate between skin line up and skin line down orientations (Figure 4-8).

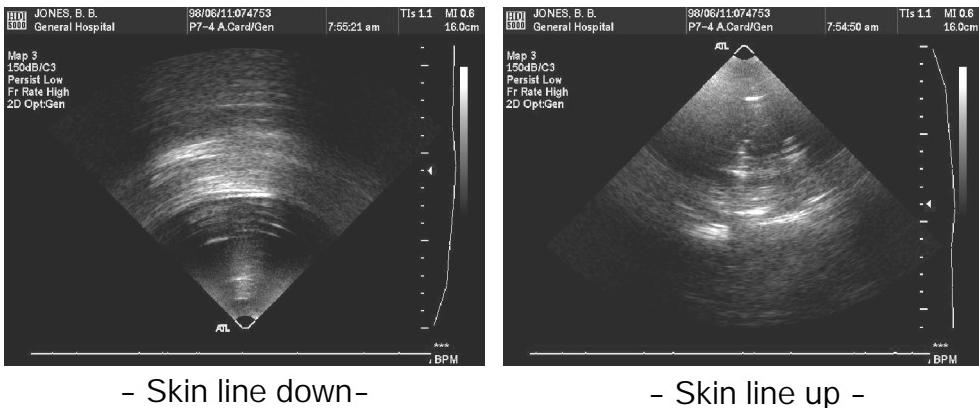


Figure 4-8. 2D Image Orientation (TOP/BOT)

Imaging

" To adjust 2D sector width and steer the 2D sector:

1. Press **SEC WIDTH** down to decrease the sector width (Figure 4-9). The frame rate changes as the sector width is changed.
2. Use the trackball to steer the sector.
3. Press **SEC WIDTH** up to increase the sector width.

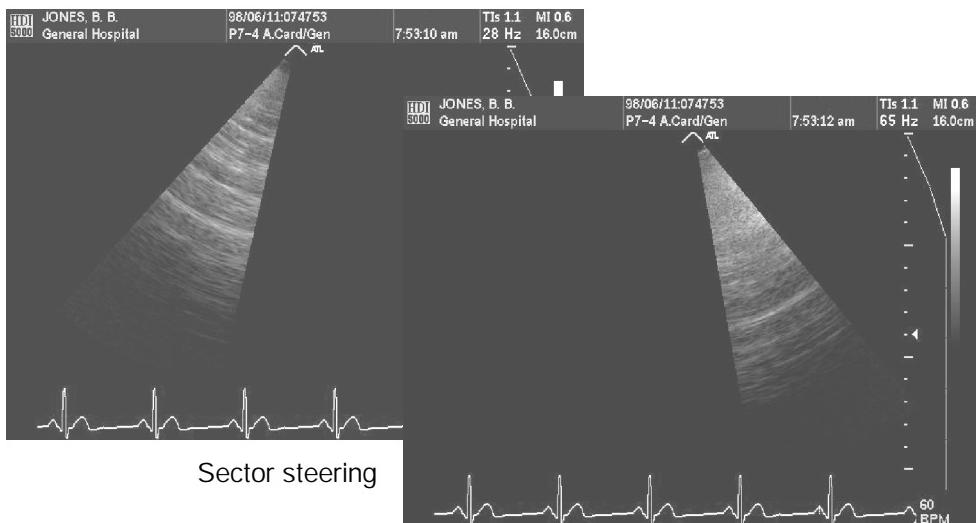
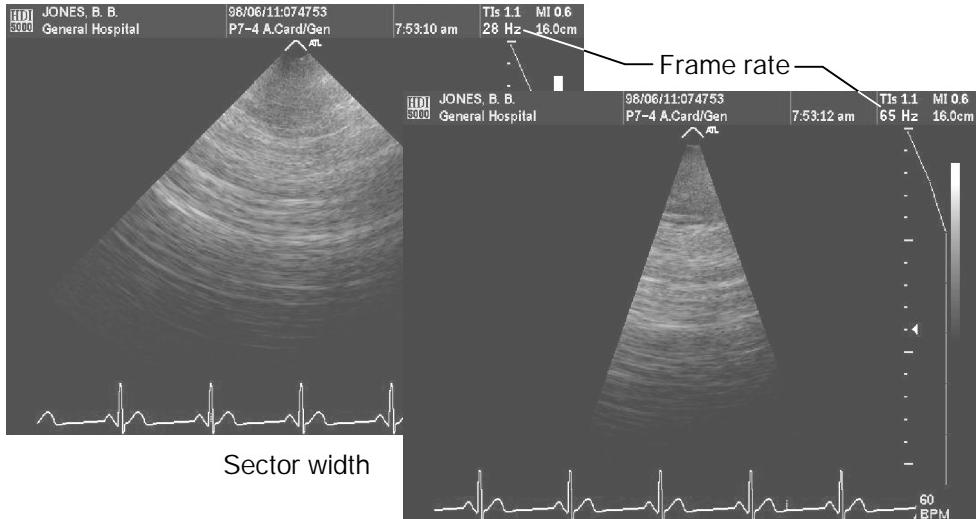


Figure 4-9. Sector Width and Steering

Imaging

" To use zoom:

1. Press the **ZOOM** control up to magnify the 2D image (Figure 4-10).
 2. Rotate the trackball to pan the 2D image and view areas of interest.
 3. Press the **ZOOM** control down to decrease the magnification of the 2D image.
-

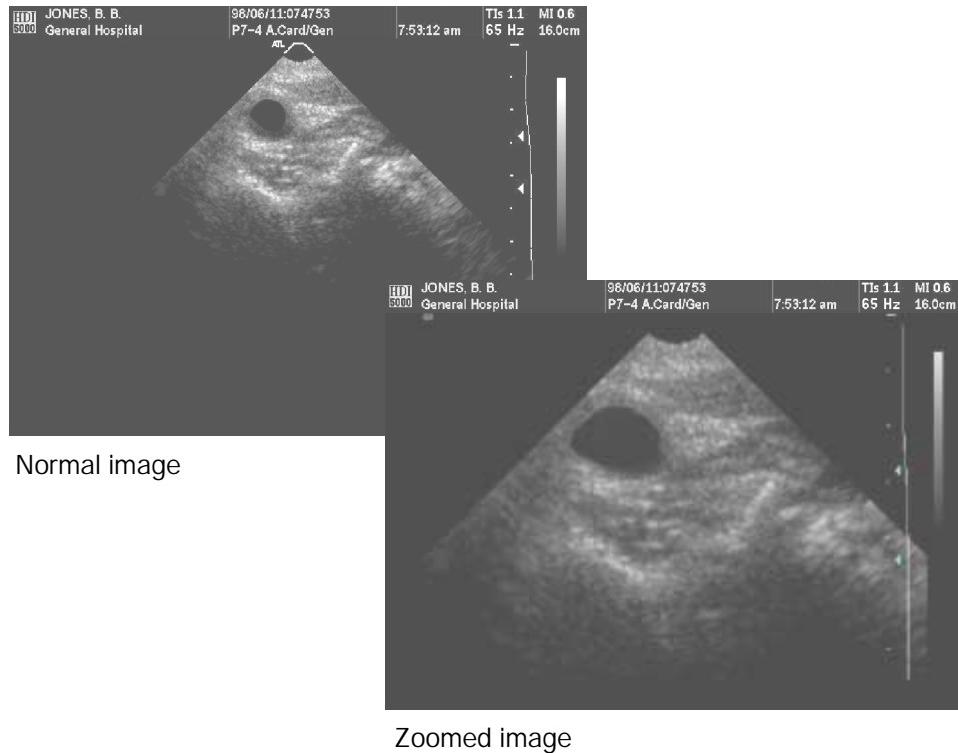


Figure 4-10. 2D Zoom

" To use HD (High Definition) Zoom:

1. During real-time 2D, M-mode, Color, Tissue Doppler (TDI), or Power imaging, press the **HD ZOOM** control. The HD Zoom box appears on the 2D display and defines the region of interest ([Figure 4-11](#)). In Color or Power, the overlay defines the region of interest.
2. Use the trackball to position the HD Zoom box or overlay.
3. Press the **SELECT** control to display the trackball selection menu ([Figure 4-11](#)).
4. Press the **SELECT** control to highlight **HD Zoom Size** (or **Col Size**).
5. Use the trackball to adjust the HD Zoom size.
6. Use the **SELECT** control to alternate between **HD Zoom Size** and **Pos** (or **Col Size** and **Pos**) until you have selected the size and position that you require.
7. Press the **HD ZOOM** control to fill the image display area ([Figure 4-11](#)). The **HD ZOOM** indicator lights.
8. Press the **HD ZOOM** control to turn off HD Zoom.

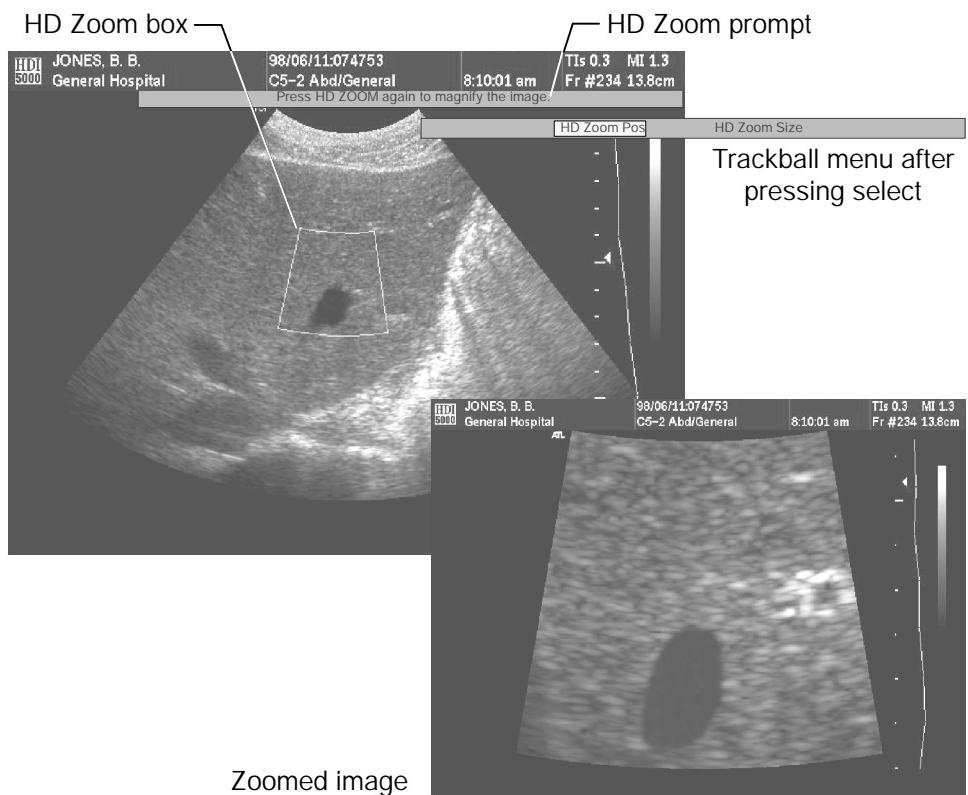


Figure 4-11. HD Zoom

Imaging

" To use the CURSOR control to designate the source of a scrolling display:

1. Press the **CURSOR** control to display the cursor. The cursor is a dotted line that includes a depth cursor (Figure 4-12). An angle correction cursor can be added by pressing the **ANG COR** control.
2. Move the dotted-line cursor to the desired location on the 2D display. (When you switch to a scrolling imaging mode, the scrolling imaging display will be derived from the selected cursor location on the 2D display.)
3. Move the depth cursor to the desired depth. (A Doppler imaging display will invoke the sample volume (SV) depth indicated by the depth cursor.)
4. If needed, press the **ANG COR** control to display and set the Doppler angle. (A Doppler imaging display will invoke the angle correction.)
5. You may want to move back and forth between 2D and a scrolling imaging mode (CW or PW Doppler or M-mode). To do this press the **UPDATE** control.
6. To turn off the cursor, press the **CURSOR** control.

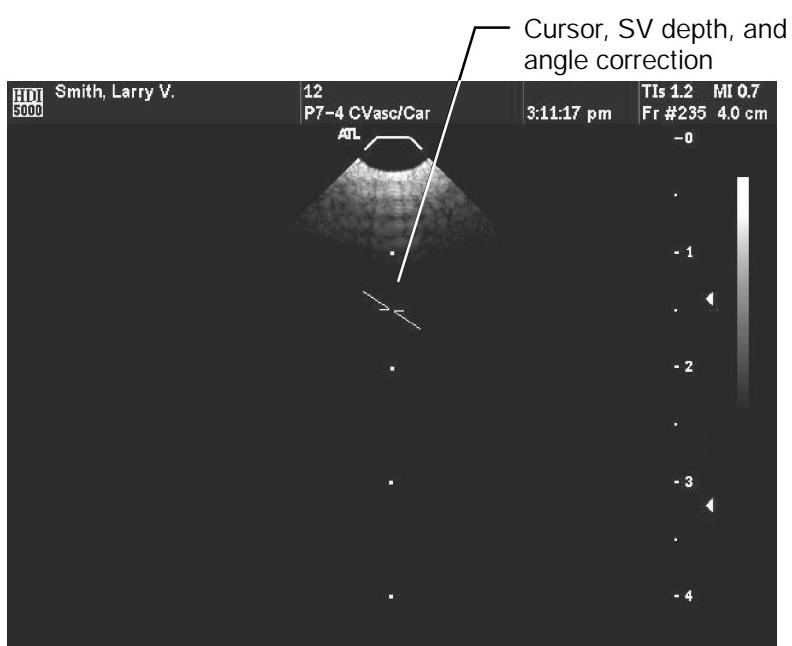


Figure 4-12. Cursor

Imaging

- " To adjust the pulsed Doppler sample volume depth:

During pulsed Doppler imaging, use the trackball to move the sample volume depth cursor and the D-line as required (Figure 4-13). The sample volume depth annotation changes to reflect the depth of the sample volume cursor on the 2D display.

- " To adjust the pulsed Doppler sample volume size:

- Press the **SV SIZE** control up to increase the sample volume size. (Figure 4-13). The **SV Size** value annotation on the display changes to reflect the sample volume size selection. The **TI** and **MI** values can also change.
- Press the **SV SIZE** control down to decrease the sample volume size.

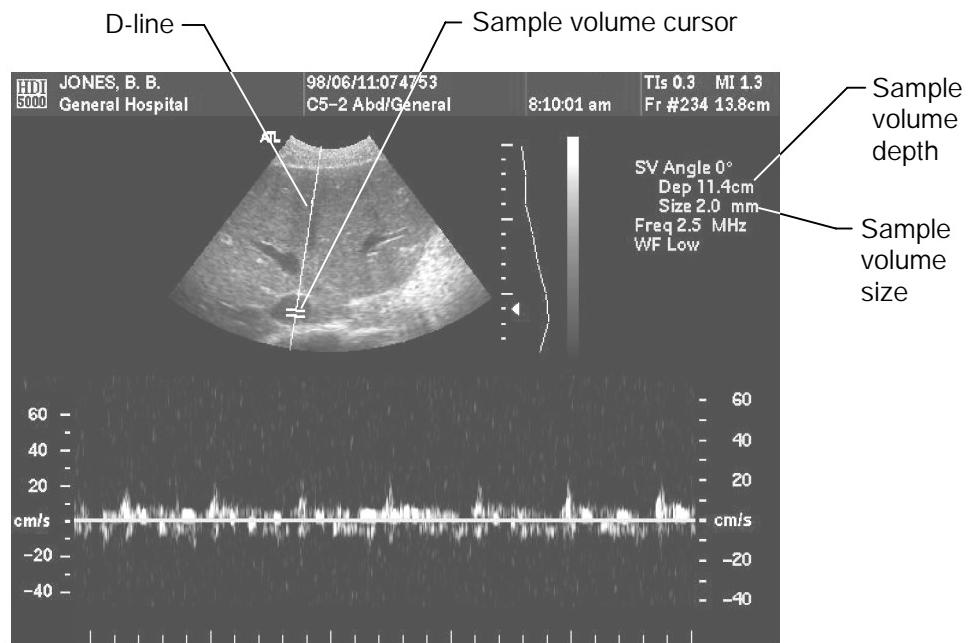


Figure 4-13. Sample Volume Depth and Size

" To adjust the angle correction:

The flow direction cursor rotates relative to the D-line and sample volume cursor when **ANG COR** is pressed (Figure 4-14). The velocity scale is automatically corrected for the angle depicted on the 2D image. See also "[To use the CURSOR control.](#)"

- Press the **ANG COR** control to correct for the Doppler angle. (Press up for clockwise rotation of the flow direction cursor, press down for counterclockwise rotation.)
 - You can also use the **0/60°** control to quickly set the flow direction cursor at angles of 0 or ± 60 degrees, and then use the **ANG COR** control for finer adjustments.
-

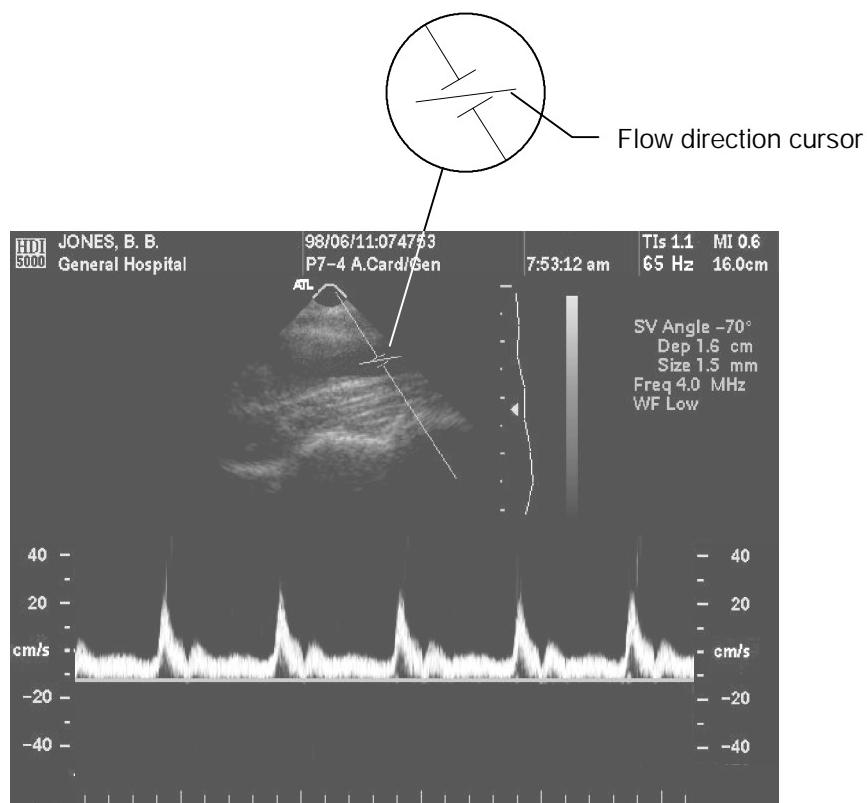


Figure 4-14. Doppler Angle Correction

- " To adjust the CW Doppler focus indicator:

During CW Doppler imaging, use the trackball to move the focus indicator and the D-line as required (Figure 4-15). The CW Doppler display does not update when the focus indicator is moving. The CW Doppler display updates after you have established the focus indicator location.

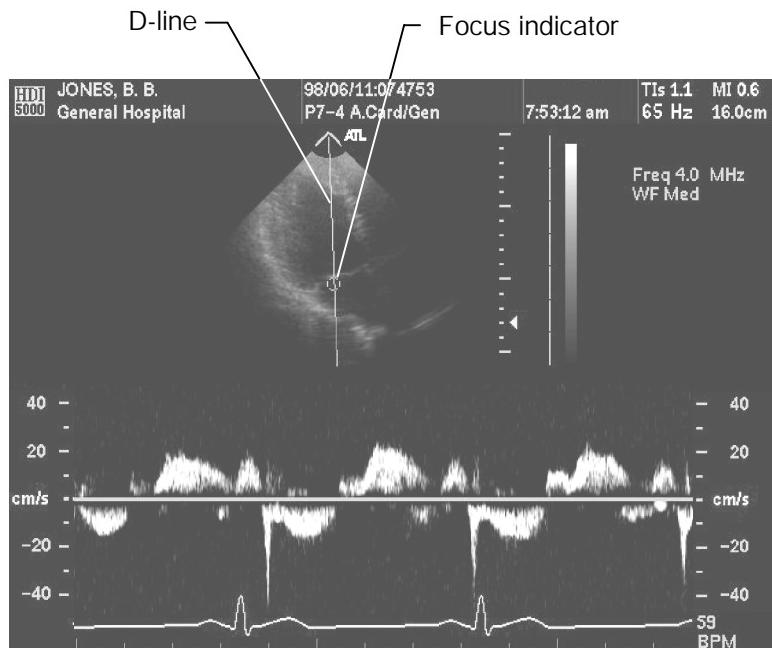


Figure 4-15. CW Doppler Focus Indicator

Imaging

" To adjust the steering angle (linear array):

Press the STEER control to change the steering angle for a linear array image (Figure 4-16).

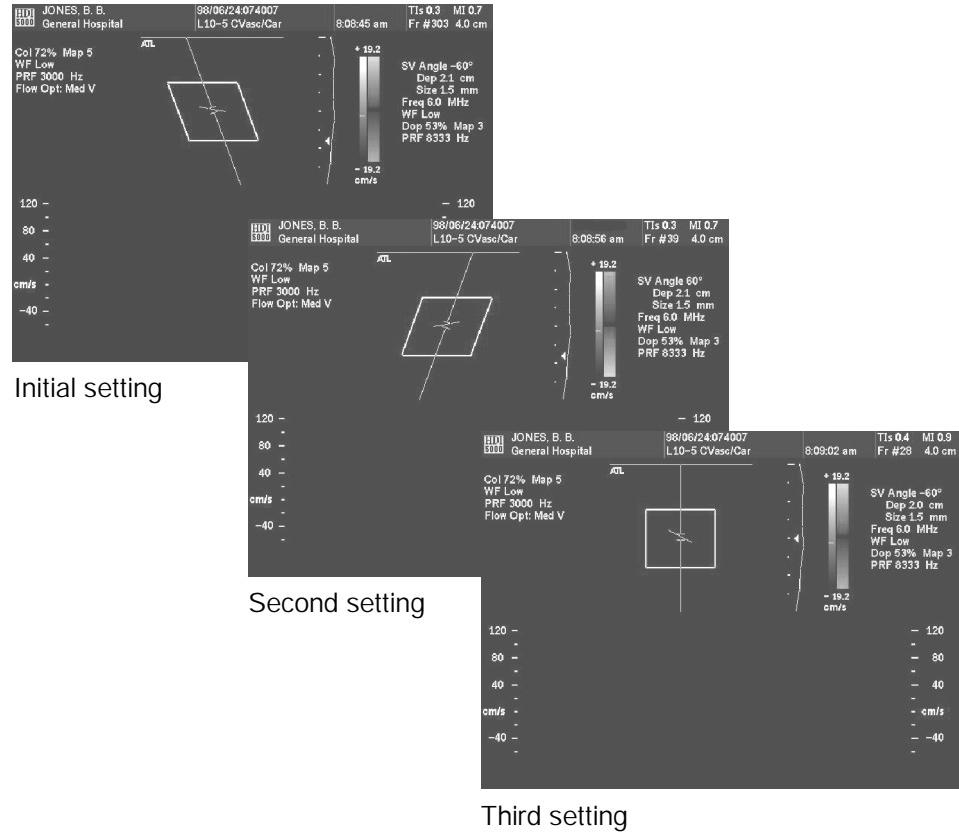


Figure 4-16. Steering Angle (Example)

Imaging

- " To adjust the size and position of the Color or Power overlay:

1. During Color or Power imaging, press the **SELECT** control to display the trackball selection menu (Figure 4-17). The trackball selection menu appears above the image display for five seconds after you press the **SELECT** control.
2. Press the **SELECT** control to highlight **Col Pos** or **Col Size**.
3. Use the trackball to establish the desired Color overlay size or position: both the width and the height of the Color overlay can be adjusted with the trackball.

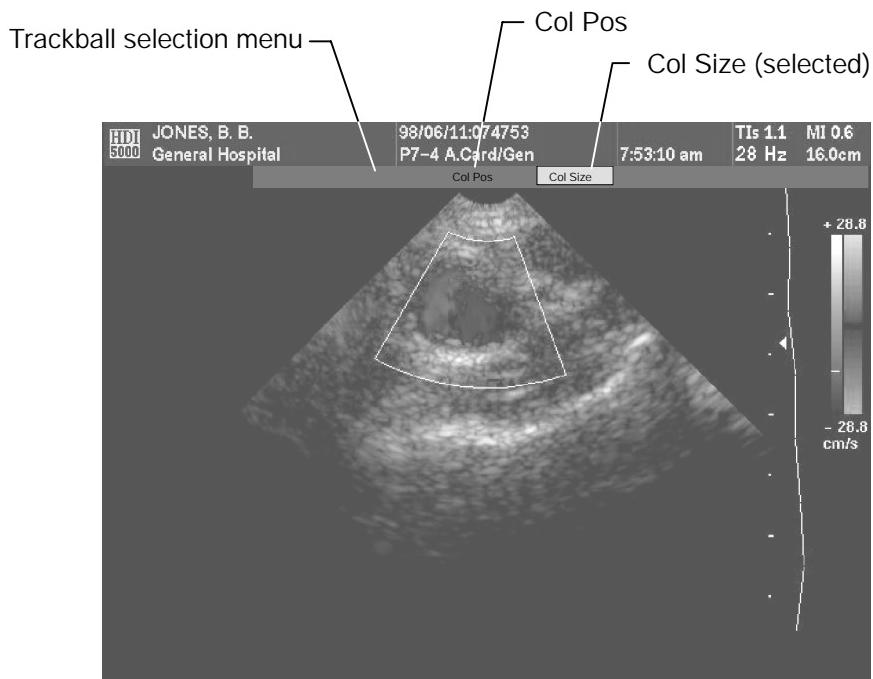


Figure 4-17. Color Overlay Size and Position Adjustment

- " To invert Color or Doppler data:

Press the **INVERT** control. The color bar reflects the change in the color assignments. The Doppler spectral data inverts relative to the baseline.

- " To adjust the Color or Doppler baseline:

- Press the **BASELINE** control up to raise the baseline and shift the values above and below the baseline.
- Press the **BASELINE** control down to lower the baseline and shift the values above and below the baseline.

Imaging

- " **To adjust the Doppler, Color, or Power filter:**
 - Press the **FILTER** control up to increase the amount of low frequency wall motion that will be filtered. (The **FILTER** control does not work in Tissue Doppler Imaging.)
 - Press the **FILTER** control down to decrease the amount of low frequency wall motion that will be filtered.
- " **To adjust the Doppler, Color, or Power scale:**
 - Press the **SCALE** control up to increase the range of the display. The Nyquist values, frame rate, and the PRF change to reflect the change, as appropriate. (High PRF is available with some scanheads. Pressing the **SCALE** control automatically invokes high PRF for these scanheads, displaying additional sample volumes.)
 - Press the **SCALE** control down to decrease the range of the display. The Nyquist values, frame rate, and the PRF change to reflect the change, as appropriate.
- " **To adjust the Color or Power priority threshold:**
 - Press the **PRIORITY** control up to raise the echo amplitude threshold above which the system will display gray scale instead of Color or Power. The write priority indicator, represented graphically on the gray scale as a short horizontal line across the gray scale, changes position to show the color/gray scale threshold.
 - Press the **PRIORITY** control down to decrease the priority threshold.
- " **To activate triple mode:**
 1. During 2D imaging, press the **COLOR** control. Color imaging begins.
 2. Press the **PULSED** control. The Doppler display appears.
 3. Simultaneously press the **Superkey** and the **Simult** key to activate triple mode, or perform steps 4 through 7.
 4. Press the **DOPPLER MENU** control. The Doppler menu appears.
 5. Select **2D Update**. The **Update** menu appears.
 6. Select **Simul**. Triple mode begins.
 7. Select **Close**, or press the **DOPPLER MENU** control to remove the menu.

Imaging

" To display dual images:

1. During 2D acquisition, press the **DUAL** control. The 2D image becomes smaller and shifts to the left of the display screen.
2. Press **UPDATE** to display a second 2D image and alternate between update of images (Figure 4-18). The image on the right is now updating. The orientation marker flashes to indicate that the image is updating.
 - The following **2D MENU** controls can be used to modify both images: **Chroma**, **Gray Maps (GMap)**, **2D PRF**, **TIs/TIb**, and **Persistence**.
 - **FREEZE** and the remaining 2D controls can be used to modify the updating image. During freeze, Cineloop review is possible, using the trackball; the functions on the **Cineloop** menu are not available.
 - **HD ZOOM** is not available in dual imaging.
 - You can measure across dual images, if the same magnification, sector width, and scale are in use (Figure 4-18).
3. Press the **DUAL** control to turn off the display of dual images and return to normal 2D imaging.

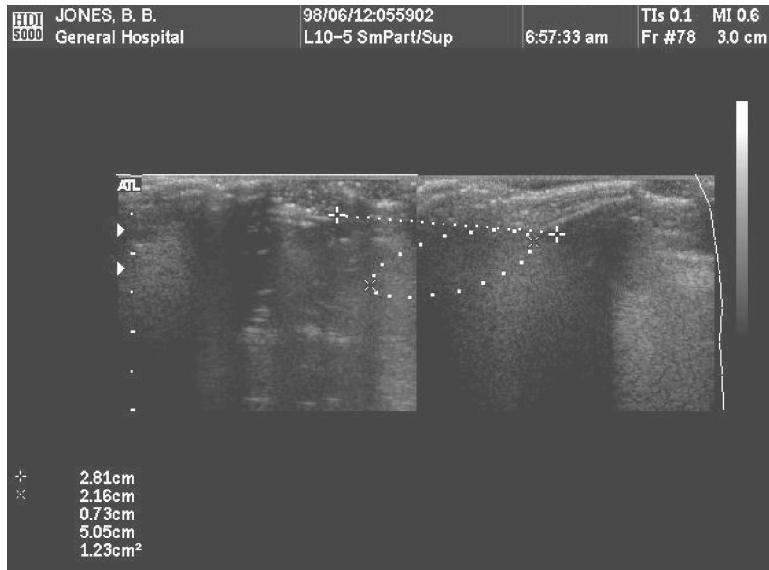


Figure 4-18. Dual 2D Image Display Showing Measurements Across Images

Imaging

- " To use a 2D Cineloop sequence:

1. During 2D image acquisition, press **FREEZE**. The frame rate display changes to a frame counter, reflecting the number of the currently displayed frames in the Cineloop sequence (Figure 4-19). (When ECG is displayed, the frame counter is not displayed.)
 2. Rotate the trackball to the left or to the right to move through the Cineloop sequence selecting and displaying the frames within the Cineloop sequence.
-



Figure 4-19. 2D Cineloop Review

- " Using the Cineloop Image Review controls:

1. Press the **3D/CINE MENU** control to display the **Cineloopr** menu (Figure 4-20).
 - Select **Play/Pause** to alternate between play and pause. (You can also use the **Superkey** and the **Cine Playback** key.)
 - Select **+Speed** or **-Speed**, while the Cineloop sequence is replaying, to vary the speed.
 - Select **Sweep/Loop** to alternate between sweep and loop. Note that the type of playback, sweep or loop, is annotated in the annotation area at the top of the display in place of the frame counter (Figure 4-19).

2. To play back a selected portion of the Cineloop sequence:
 - a. In pause, select **Trim**. The Cineloop graphic and trim cursors appear, and the left trim cursor is enabled.
 - b. Trim the Cineloop sequence ([Figure 4-20](#)).
 - c. Press **SELECT** until **Trim Right** is highlighted on the trackball menu, to enable the other trim cursor.
 - d. Trim the Cineloop sequence.
 - e. Press **SELECT** until **Cineloop Review** is highlighted on the trackball menu.
 - f. Use the trackball to move the frame-select cursor, displaying single frames within the trimmed Cineloop sequence.
 - g. Press **SELECT** to switch between trim cursors and review. Use the trackball to move the trim cursors or the frame select cursor, as desired.
 - h. Select **Play/Pause** from the **Cineloopr** menu to play the Cineloop sequence.
3. Select **Close** on the **Cineloopr** menu.
4. Press **FREEZE** to return to 2D imaging.

Trackball menu (appears after selecting **Trim** or pressing **SELECT** during trimming, disappears after 5 seconds)

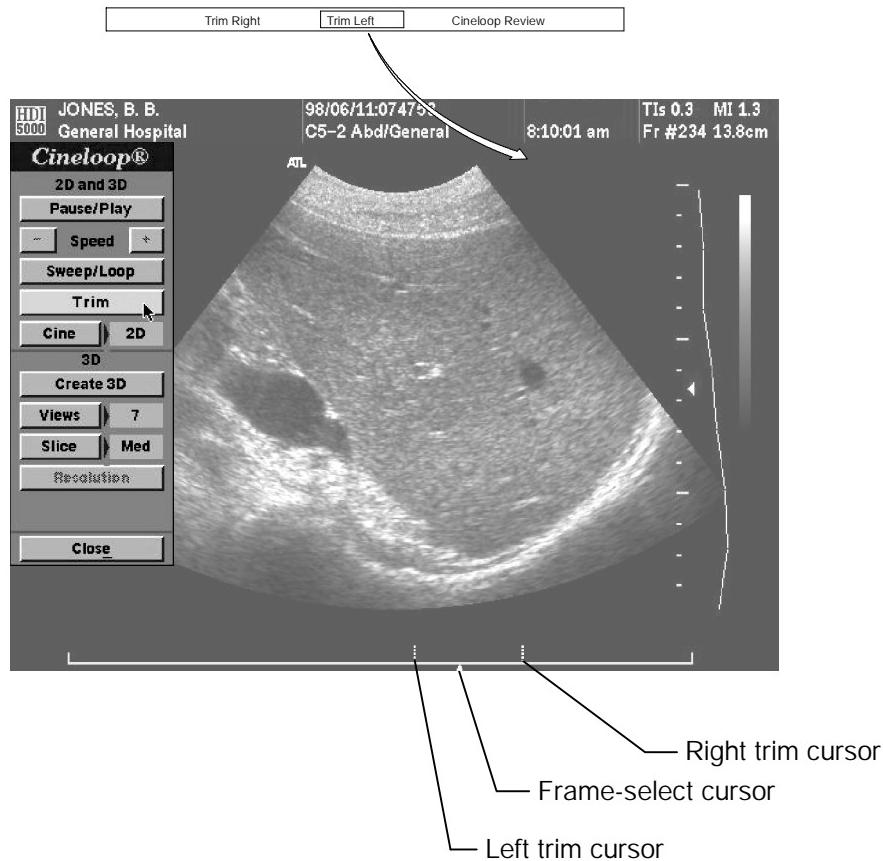


Figure 4-20. Trim Cursors

Imaging

- " **To use M-mode review:**

1. During M-mode imaging, press the **FREEZE** control.
2. Review the M-mode data.
 - As you rotate the trackball to the left, the M-mode display scrolls to the right, displaying the older M-mode review data.
 - As you rotate the trackball to the right, the M-mode display scrolls to the left, displaying the more recently acquired M-mode review data.
3. Press the **FREEZE** control to return to M-mode imaging.

- " **To use Doppler review:**

Note *Changing the PRF, scale, baseline, invert, display format, steer, sample volume size or depth, or sweep speed during scrolling clears the Doppler review memory buffer. The Doppler review memory buffer is cleared to ensure that the Doppler review data and the display scaling correspond.*

1. During active Doppler acquisition, press the **FREEZE** control.
2. Review the Doppler data.
 - As you rotate the trackball to the left, the spectral display scrolls to the right, displaying the older Doppler review data.
 - As you rotate the trackball to the right, the spectral display scrolls to the left, displaying the more recently acquired Doppler review data.
3. Press the **FREEZE** control to return to Doppler imaging.

" To adjust a physio display:

1. Press the **PHYSIO MENU** control to display the **Physio** menu (Figure 4-21).
2. Select **Adjust** until the physio display that you want is shown. The choices are **ECG**, **ChA**, and **ChB**.
3. At this point you can adjust the gain, position, size of display, hide ChA or ChB, and configure the display selected in step 2:
 - Select **+ Gain** or **- Gain** to adjust the gain of the physio trace. The default gain setting is set for most patients. If the signal appears too weak, check the connections or placement of the leads or transducer before adjusting the gain setting.
 - Select **+ Position** or **- Position** to position the physio trace on the display.
 - Select **Display** to choose Small (**Sm**), Medium (**Med**), or Large (**Lg**). The physio display will assume the display size that you select.
 - Select **ECG** to turn the ECG display **On** or **Off**.
 - Select Ch A/B to choose **Hide** or **Show**. Selecting **Show** displays the Ch A/B physio display, **Hide** does not display the physio display.

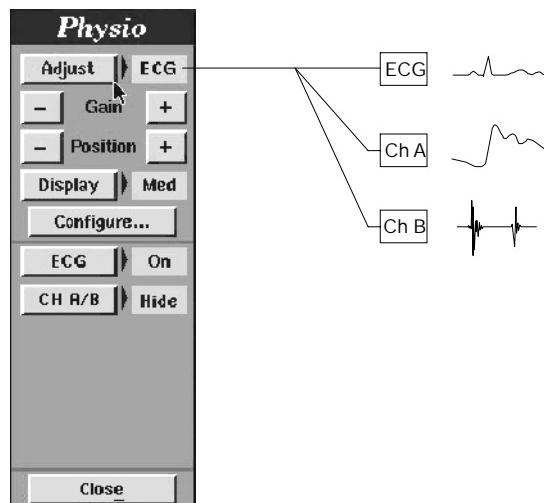


Figure 4-21. Adjusting the Physio Display

4. When you select the **Configure** submenu, use the trackball and the **SELECT** control to configure the channel as follows:
 - For ECG, the **Triggers** menu appears. (See "To configure for ECG-triggered operation")
 - For Channel A, select **Aux** (auxiliary), **Pulse**, or turn off Channel A.
 - For Channel B, select **Aux**, **Phono**, or turn off Channel B.
 - For Channel B, select a phono filter: **Off**, **Low**, **Med** (medium), or **High**.

" **To configure for ECG-triggered operation:**

ECG-triggered operation is available in 2D, Power Motion Imaging (PMI), and Color imaging, and is used for Contrast Specific Imaging (CSI). For more information about the use of CSI and Flash, see the "Physio" section of the *Reference Manual*.

1. Press the **PHYSIO MENU** control to display the **Physio** menu.
2. Ensure the ECG display is on.
3. To adjust the ECG display, select **Adjust** until **ECG** appears.
4. If necessary, change the ECG gain and position.
5. Select **Configure** to display the **Triggers** menu. (You can also press **TRIGGERS** to display the **Triggers** menu.)
6. Select **Trigger Type** + or - to cycle through to your choice of **Trigger A**, **Trigger B**, or **A&B**.
7. Select **Delay (ms) A+** or **Delay (ms) B+** to increase the delay of the ECG triggers ([Figure 4-22](#)).
8. Select **Delay (ms) A-** or **Delay (ms) B-** to decrease the delay of the ECG triggers ([Figure 4-22](#)).
9. Select **Trigger Interval Each N** + or - to skip ECG triggers.
10. Select **Frames** to change the number of frames for each triggered acquisition.
11. Select **Frame Interval** to select a delay between frames, if there are multiple frames for each trigger. The **FR** setting is the normal system frame rate.
12. To alternate between ECG-triggered acquisition and 2D imaging:
 - Press **UPDATE**
 - If you have a footswitch, press and release the **UPDATE** (middle) footswitch.

Imaging

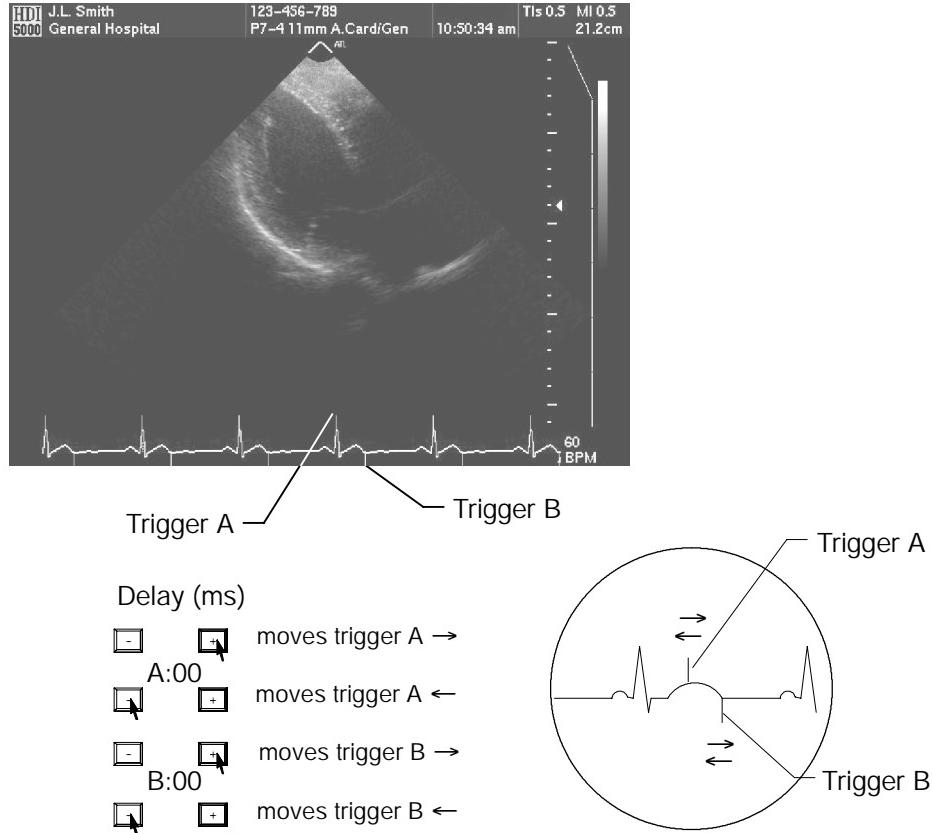


Figure 4-22. ECG Trigger Positioning

Annotating the Display

The alphanumeric keys and the **Title**, **Arrow**, **Home**, **Text**, **Body Marker**, and **SH Pos** (Scanhead Position) keys are used to annotate the display. The **Set Home Superkey** is used to set the home position of the annotation cursor.

- " **To annotate with the Title key:**

1. Press the **Title** key. A cursor appears in the title annotation area (Figure 5-1). The cursor can be moved using the trackball, **Backspace** key, or the arrow keys within the title annotation area.
2. Use the keyboard to enter a title in the title annotation area.
3. Press the **Title** key a second time to end title data entry.

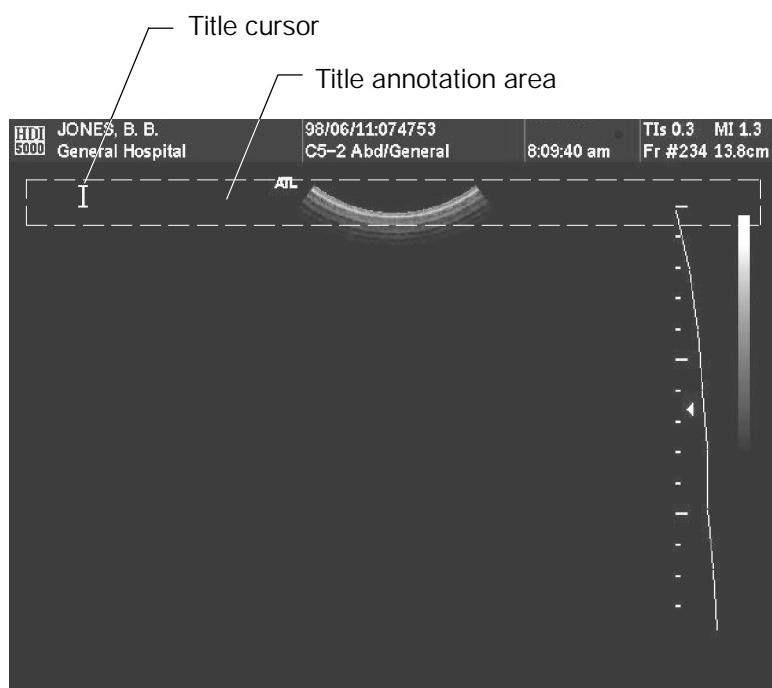


Figure 5-1. Entering Title Annotation

Annotating the Display

" To annotate the display with the Text key:

1. Press the **Text** key. A cursor appears in the text annotation area (Figure 5-2). The trackball, the **Backspace** key, or the arrow keys can be used to move the cursor anywhere within the text annotation area.
2. Use the keyboard to enter text.
3. Press **Return** to continue the text on the next line.
4. Press the **Text** key a second time to end text data entry.

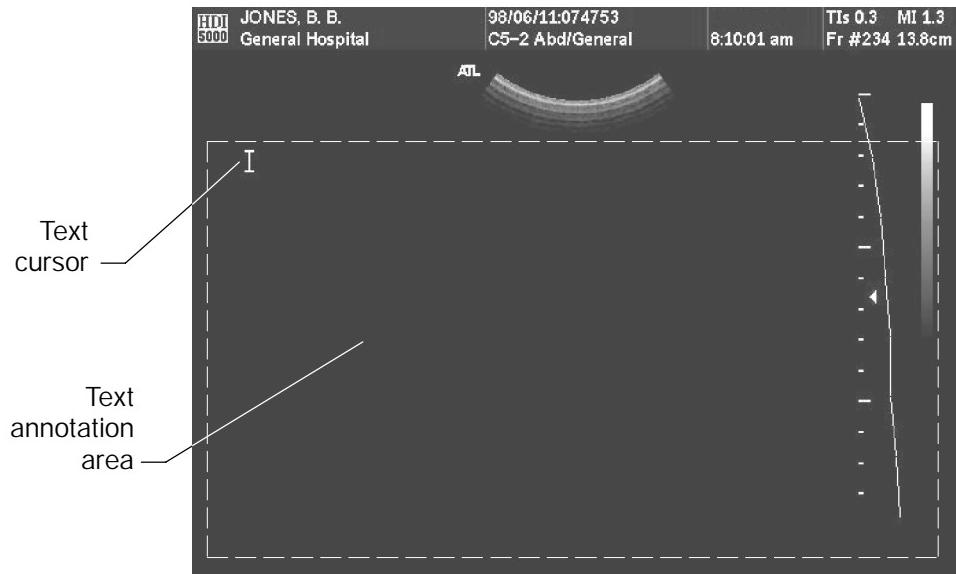


Figure 5-2. Entering Text Annotation

Annotating the Display

" To annotate with the Body Marker key:

Each clinical option has a set of body markers to choose from, you can cycle through them by pressing the **Body Marker** key. A scanhead position marker can be added to indicate the viewing angle.

1. Press the **Body Marker** key. A Tissue Specific body marker appears on the display (Figure 5-3).
2. Press the **Body Marker** key to cycle through the available body markers.
3. Use the trackball to position the body marker on the display.
4. Press the **SELECT** control to anchor the body marker.
5. To remove the body marker, press the **Body Marker** key until the body marker is removed.

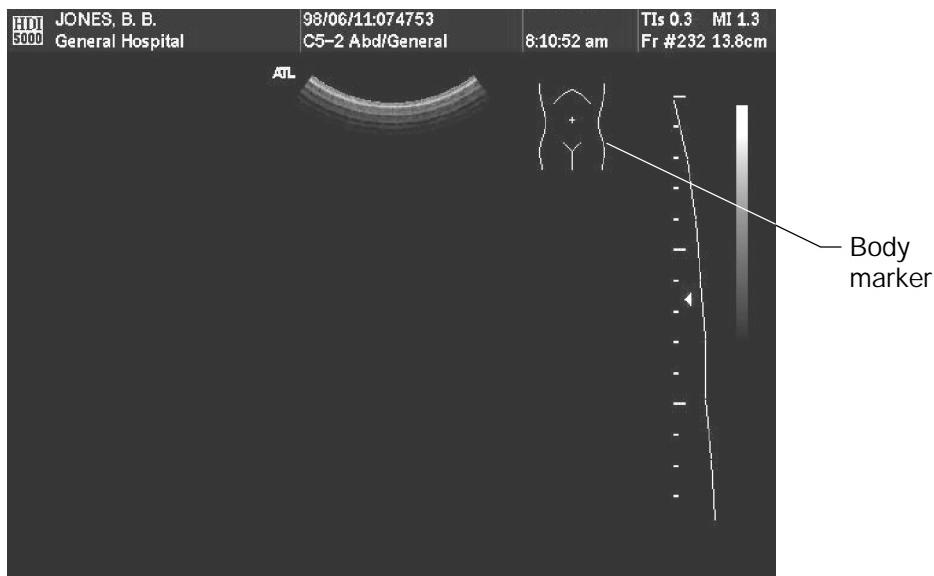


Figure 5-3. Body Marker Annotation

" To annotate with the SH Pos key:

1. Press the **Body Marker** key, a body marker appears.
2. Press **Body Marker** repeatedly to cycle through the available body markers.
3. Use the trackball to position the body marker.

Annotating the Display

4. Simultaneously press the **Superkey** and the **SH Pos** key. A scanhead position marker appears on the body marker (Figure 5-4).
5. Use the trackball to position the scanhead position marker on the body marker.
6. Use the arrow keys to rotate the scanhead position marker clockwise or counterclockwise.
7. Press the **SELECT** control to anchor the scanhead position marker.
8. To remove the scanhead position marker, press the **Superkey** and the **SH Pos** key until the scanhead position marker is removed from the body marker, or press the **Body Marker** key until both the body marker and the scanhead position marker are removed from the display.

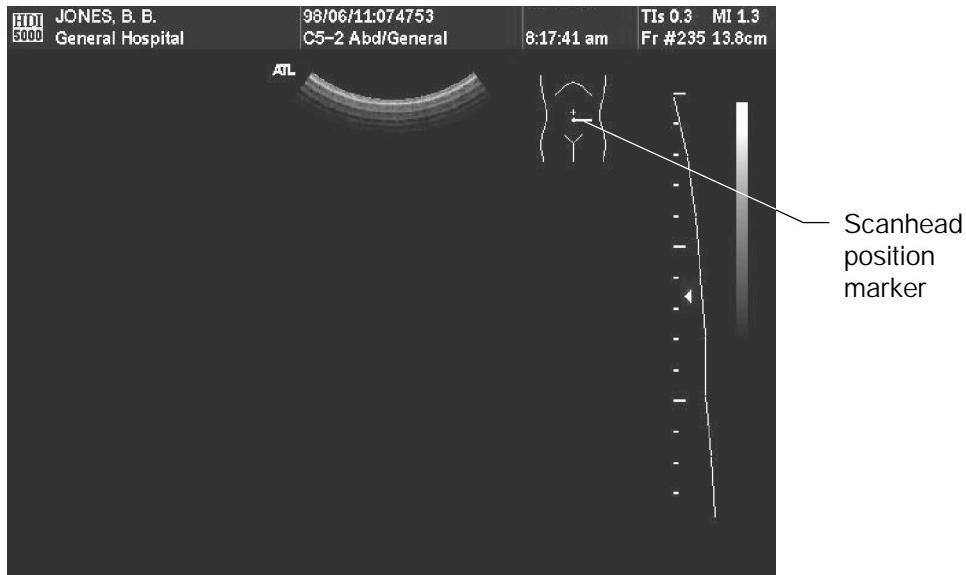


Figure 5-4. Scanhead Position Marker

Annotating the Display

- " To display pre-defined or custom (user-defined) annotation with the Text A, B, C, and D keys:
 1. Press the **Text** key.
 2. Move the annotation cursor to the desired location.
 3. Press the **Text A, B, C, or D** key to bring up initial annotation (Figure 5-5).
 4. Press the **Text A, B, C, or D** key repeatedly to cycle through the annotations.

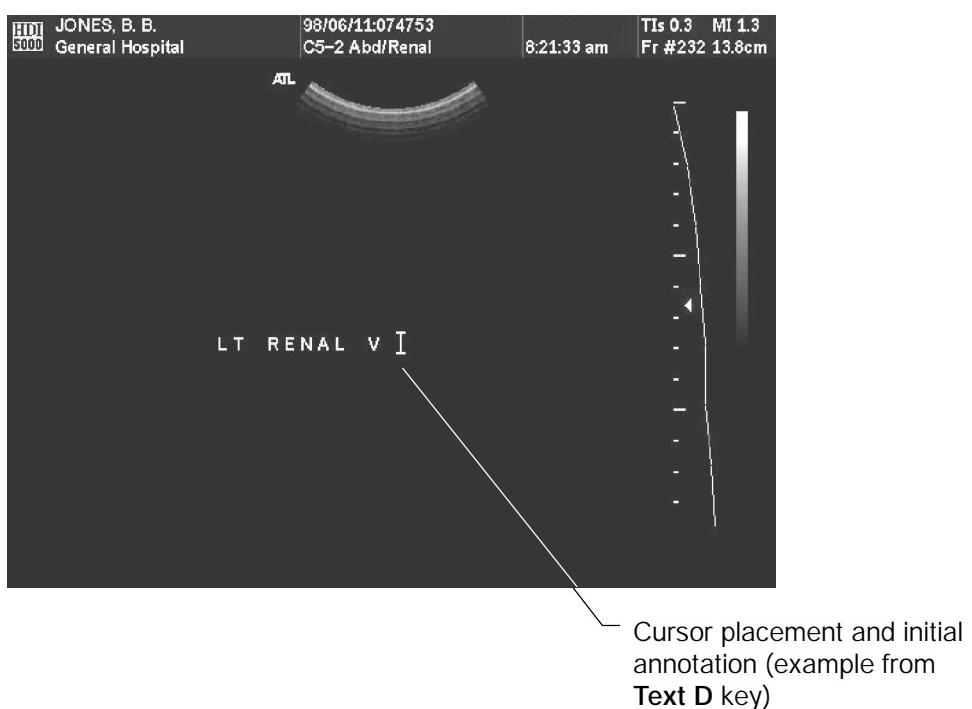


Figure 5-5. Using Pre-defined Annotation

Annotating the Display

" To create annotation for the Text keys:

Using the **Annotation** setups, you can create a list of terms associated with a Tissue Specific application and then assign that list to one of the four **Text** keys (Figure 5-6). Once you have created the annotation and assigned it to a **Text** key, pressing that **Text** key cycles through the terms in the list for annotation of the image display.

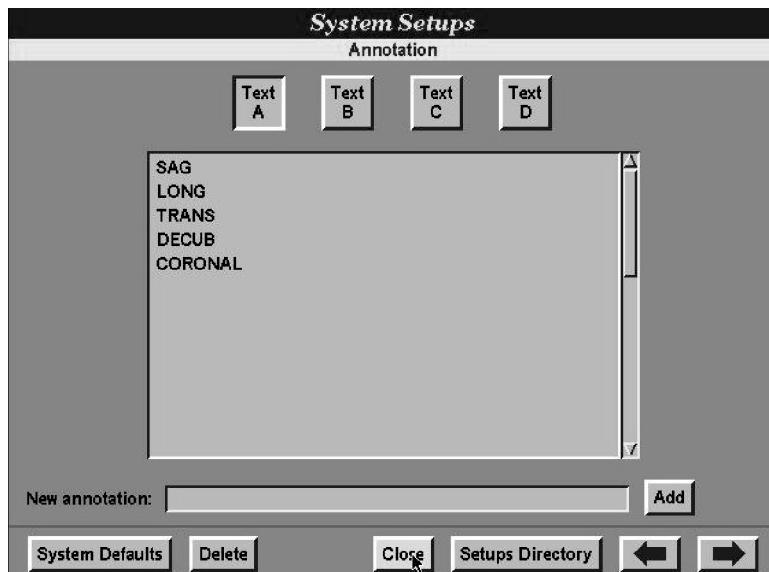


Figure 5-6. Annotation Setsups

1. On the **Directory of Setup Options**, select **Annotation**. The **Annotation** setups screen appears (Figure 5-6).
2. Select **Text A**, **B**, **C**, or **D**. A list of terms already assigned to the **Text** key appears in the **Annotation** field.
3. Move the cursor to the **New annotation** field.
4. Press the **SELECT** control to activate text entry. The text entry cursor appears in the **New annotation** field.
5. Use the keyboard to enter the text that you want to add.
6. Select **Add** to add the entered term to the **Annotation** list.
7. Select **Close**. The **Annotation** setups screen is removed and imaging begins.

Annotating the Display

- " To delete annotation from the Text key lists:
 1. On the **Directory of Setup Options**, select **Annotation**. The **Annotation** setups screen appears.
 2. Select **Text A, B, C, or D**. The corresponding list appears.
 3. Select the term that you want to delete.
 4. Select **Delete**. The term is deleted from the **Annotation** list.
 5. Select **Close**. The **Annotation** setups screen is removed and imaging begins.
- " To establish a home position for the annotation cursor:
 1. Press the **Title** key or the **Text** key.
 2. Use the trackball to position the annotation cursor.
 3. Press and hold the **Superkey**, and then press the **Set Home** key. A prompt indicates that the home position for the text cursor or the title cursor has been set ([Figure 5-7](#)). The annotation cursor will appear in the new home position the next time you press the **Title**, **Text**, or **Home** key.

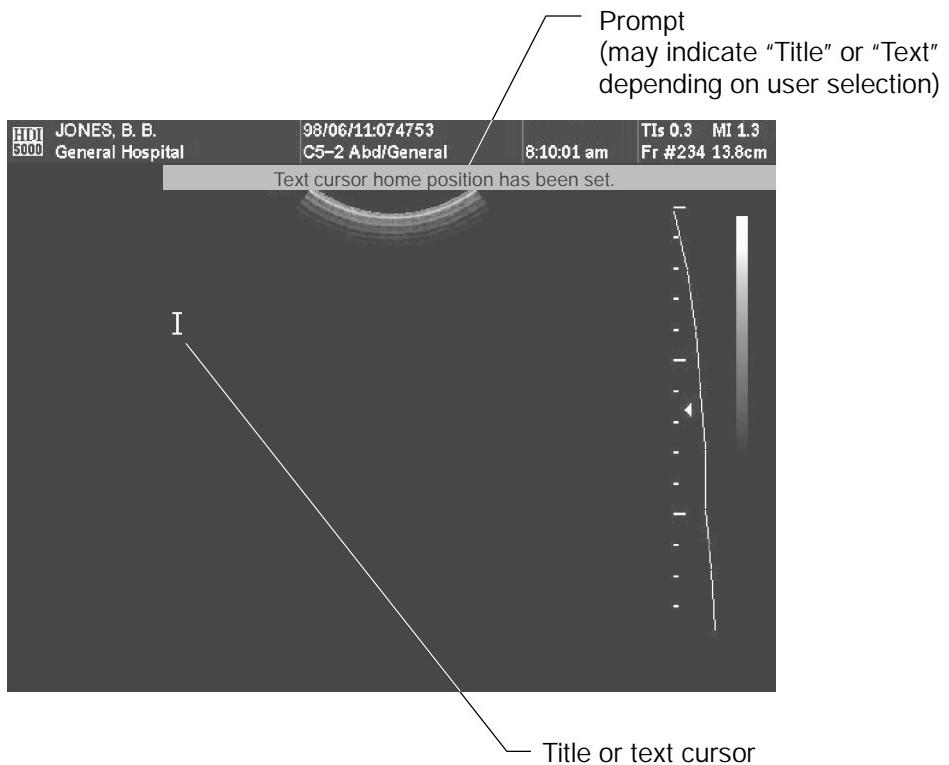


Figure 5-7. Annotation Cursor Home Position Prompt

Annotating the Display

- " **To annotate the display with an arrow:**
 1. Press the **Arrow** key, or simultaneously press **Shift** and an arrow key. An arrow is displayed.
 2. Use the trackball to position the arrow. (You can display more than one arrow at a time.)
- " **To erase annotation, perform one of the following:**
 - Position the annotation cursor to the right of the annotation that you want to erase, and press the **Backspace** key.
 - Position the annotation cursor to the left of the annotation that you want to erase, and press the spacebar.
 - Press the **Erase Text** key to erase all text entered with the **Title** or **Text** keys.
 - Press the **Erase Line** key to erase all text on the line with the cursor.
 - Press the **Erase Screen** key to erase user-entered annotation from the screen.
 - Press the **Erase Arrow** key to erase the arrows on the screen.

Making Measurements

Measurement Tools

Read the "Measurements" section in the *Reference Manual* before performing the following procedures. Guidelines in the *Reference Manual* cover the performance of measurements. You should be familiar with them before performing these procedures.

You can measure live, frozen, or stored images. Measurement values cannot be included in a protocol unless the image is frozen. A second measurement cannot be performed until the image is frozen.

Follow current medical practices when identifying specific measurement points on an image.

Measuring 2D Images

You may want to check your setups before performing the following procedures. In the **Display** setups, for 2D distance measurements, you may want to turn on the dotted line between the cursors. In the **Measurements** setups, you may want to set the 2D area method for your area measurements: **Trace By Points**, **Continuous Trace**, and **Ellipse** area methods are available. You may also want to set the volume method: **3 Distances**, **Distance and Ellipse**, and **1 Distance** are available.

- " **To perform a 2D distance measurement:**

1. During 2D, Color, or Power imaging, press the **DISTANCE** control. A cursor appears on the image. Initially, the results, in the lower left of the screen, contain the distance between the cursor and the skin line.
2. Move the cursor to the position at which you want to begin the distance measurement. The distance between the cursor and skin line (except in zoom and HD zoom) is continually updated in the results.
3. Press the **SELECT** control. A second cursor appears, and the distance between the two cursors is displayed in the results located in the lower left of the screen ([Figure 6-1](#)).
4. Move the second cursor to the desired position. The distance between the cursors is continually updated in the results.
5. Press the **SELECT** control to alternate control between the two cursors, and use the trackball to adjust the distance between the two cursors. Once you are satisfied with the locations of the cursors, the measurement is complete. The distance measurement is displayed in the results.

Making Measurements

6. At this point you can:

- Press the **FREEZE** control and then the **DISTANCE** control to perform and display up to six distance measurements at one time. Pressing the **FREEZE** control a second time erases all measurements.
- Press the **FREEZE** control and then the **CALCS** control to store the measurement values into a measurement protocol. Pressing the **FREEZE** control a second time erases all measurements.
- Press the **DEL MEAS** control to erase the measurement cursors and results. If multiple measurements have been performed, pressing the **DEL MEAS** control a second time will erase any remaining measurements.

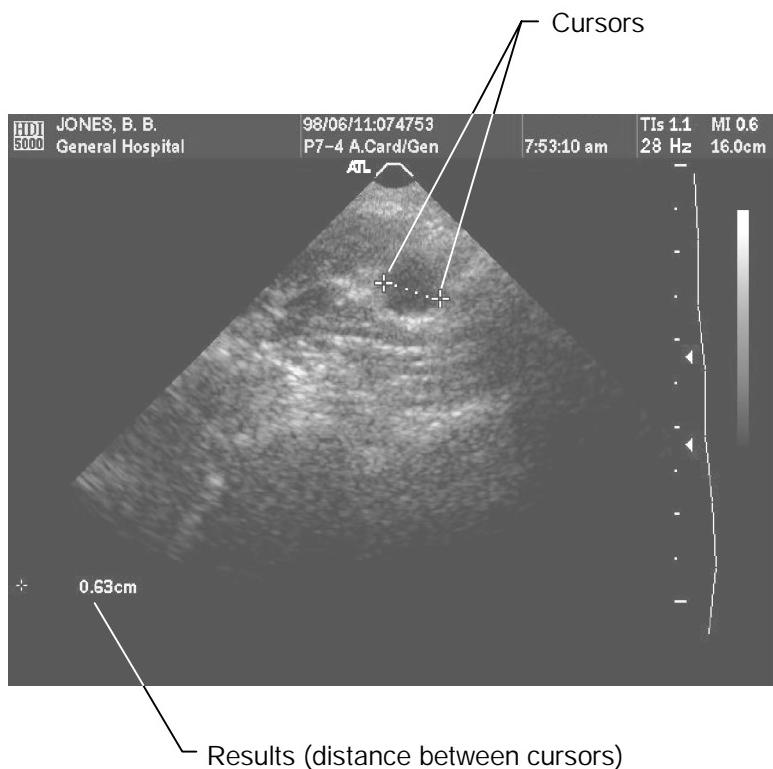


Figure 6-1. 2D Distance Measurement: Results

" To select a 2D area method:

You can set the default 2D area method in the **Measurement** setups.

1. Press the **AREA** control.

Making Measurements

- A cursor appears on the display.
 - A 5-second prompt shows the current 2D area method (Figure 6-2).
2. To change the 2D area method, press the **AREA** control. Pressing the **AREA** control three times cycles through the available 2D area methods: **Ellipse**, **Continuous Trace**, and **Trace By Points**.
 3. Perform the measurement with the area method selected. See the following procedures for detailed instructions for each area method.
-

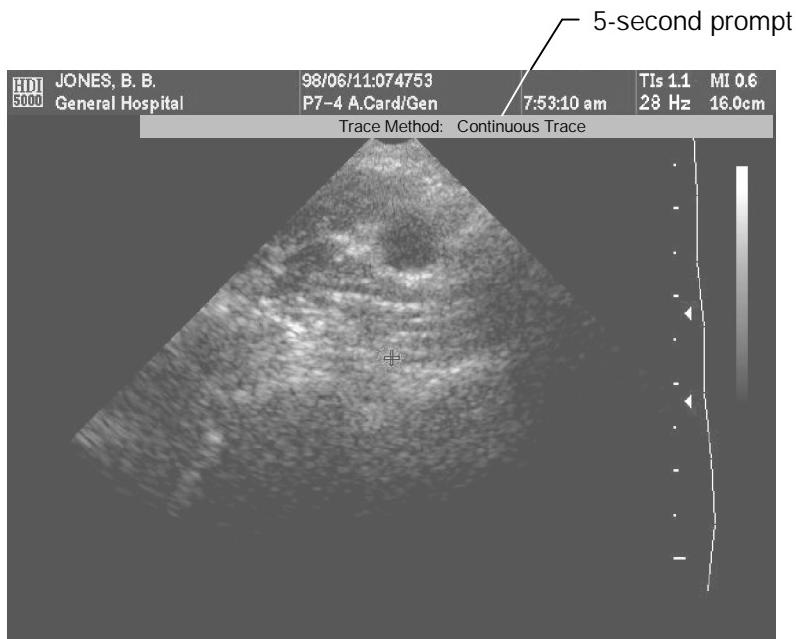


Figure 6-2. 2D Area Method: 5-second Prompt

- " To perform a 2D ellipse area measurement:
 1. During 2D, Color, or Power imaging, press the **FREEZE** control. (You can measure a live image, using the ellipse area method, but you must freeze the image before the measurements can be stored into a measurement protocol.)
 2. Press the **AREA** control. A cursor appears on the image.
 3. Use the trackball to move the cursor to a location on the perimeter of the shape to be measured.
 4. Press the **SELECT** control. The first cursor is fixed and a second cursor appears. A dotted line forms an elliptical shape based on the positions of the two cursors.

Making Measurements

5. Use the trackball to change the length of the major axis and the position of this axis.
6. Press the **SELECT** control.
7. Use the trackball to change the width of the ellipse.
8. Use the trackball and the **SELECT** control to adjust the location, size and shape of the ellipse. The major axis, minor axis, circumference, and area appear as results and update as the ellipse changes shape (Figure 6-3). Once you are satisfied with the locations of the cursors, the measurement is complete.
9. At this point you can:
 - Press the **DEL MEAS** control to erase the measurement cursors and results.
 - Press the **AREA** control to start another area measurement.
 - Press the **CALCS** control to store the measurement values into a measurement protocol.
 - Press the **FREEZE** control to erase the measurement and resume imaging.

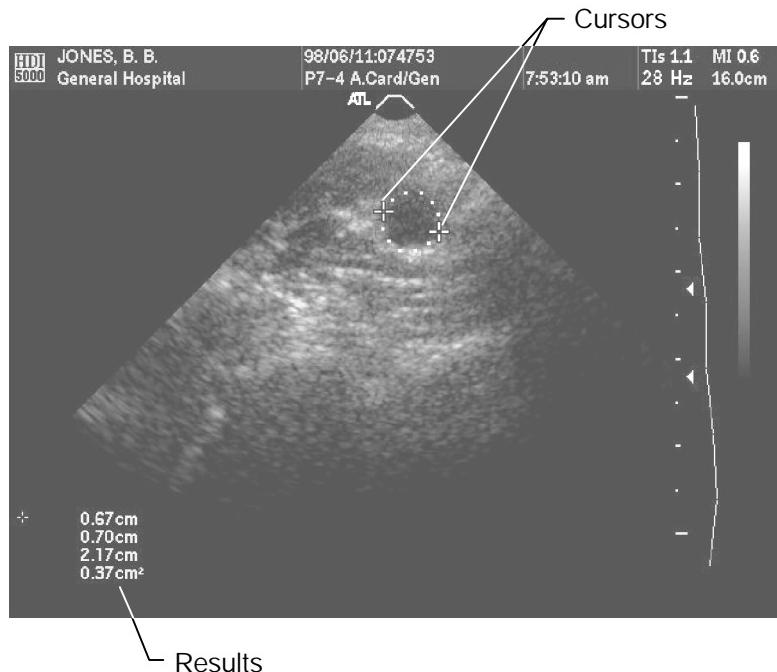


Figure 6-3. Area by Ellipse

- " To perform a 2D continuous trace area measurement:
 1. During 2D, Color, or Power imaging, press the **FREEZE** control.

Making Measurements

2. Press the **AREA** control to display a cursor on the image.
3. Move the cursor to the perimeter of the shape to be measured.
4. Press the **SELECT** control to fix the position of the cursor and display a second cursor. (The second cursor will be visible once you move the trackball.)
5. Move the second cursor around the shape. As you move the cursor with the trackball, the shape is traced on the display ([Figure 6-4](#)).
6. If required, press the **DEL MEAS** control to erase the last segment or segments of the trace.
7. Use the trackball to finish the trace near the initial cursor.
8. Press the **AREA** control to close the trace. The area and circumference measurement values are displayed in the results.
9. At this point you can:
 - Press the **CALCS** control to store the measurement values into a patient report. (If you press the **CALCS** control before closing the trace, then the trace closes and the **CALCS** menu appears.)
 - Press the **AREA** control to perform and display another continuous trace measurement. (You can display three area measurements at one time.)
 - Press the **DEL MEAS** control to erase the measurement cursors and results.
 - Press the **FREEZE** control to erase the measurement and resume imaging.

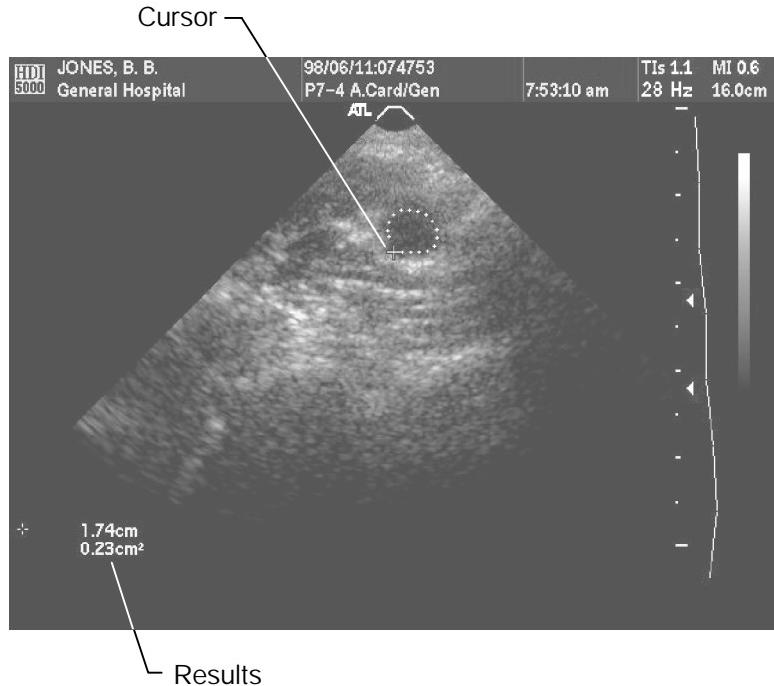


Figure 6-4. Area by Continuous Trace

- " To perform a 2D trace-by-points area measurement:
 1. During 2D, Color, or Power imaging, press the **FREEZE** control.
 2. Press the **AREA** control. A cursor appears on the image display.
 3. Move the cursor to the perimeter of the shape to be measured ([Figure 6-5](#)).
 4. Press the **SELECT** control to fix the position of the cursor and display a second cursor.
 5. Move the cursor to the next point on the perimeter.
 6. Press the **SELECT** control. A straight line is drawn between the two points.
 7. Repeat steps 5 and 6 until the perimeter is traced.
 8. If required, press **DEL MEAS** to erase the last segment or segments of the trace.
 9. Press the **AREA** control to close the trace. The area and circumference measurement values are displayed in the results.
- 10. At this point you can:
 - Press the **DEL MEAS** control to erase the measurement cursors and results.

Making Measurements

- Press the **AREA** control to perform and display another trace-by-points measurement. (You can display three area measurements at one time.)
- Press the **CALCS** control to store the measurement values into a patient report. (If you press the **CALCS** control before closing the trace, then the trace closes and the **CALCS** menu appears.)
- Press the **FREEZE** control to erase the measurement and resume imaging.

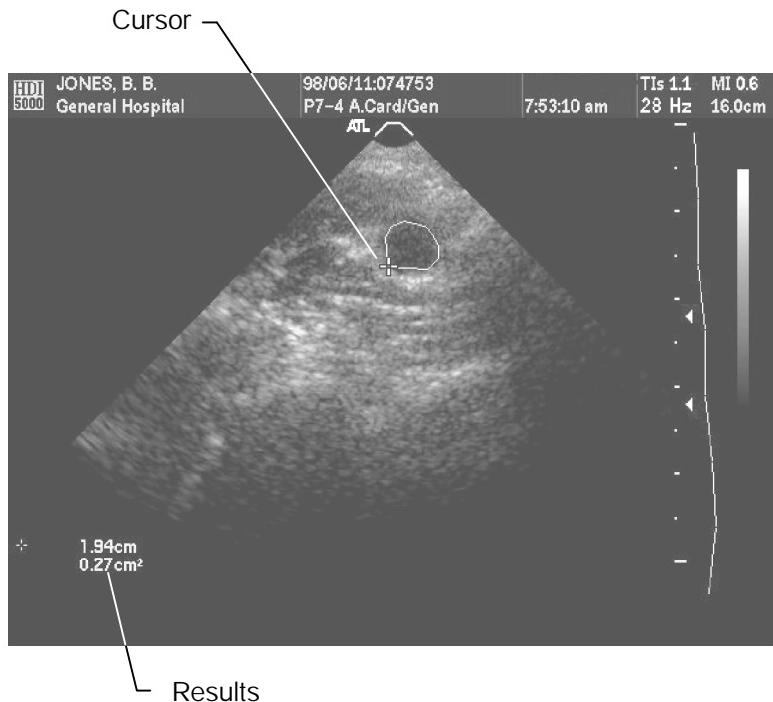


Figure 6-5. Area by Trace by Points

" To perform a 2D volume measurement:

1. During 2D, Color, or Power imaging, obtain the image that you want to measure.
2. Press the **FREEZE** control.
3. Press the **ADV MEAS** control. The **Meas Tools** menu appears on the display.
4. If you have not selected a volume method in **Measurements** setups, or you want to change the volume method, do so at this time.

Note *If you decide to change the volume method from the Meas Tools menu, using Vol Method, the volume measurement will be initiated when you make your volume measurement selection; in this case, proceed to step 6.*

Making Measurements

5. Select **Volume** on the **Meas Tools** menu. The system prompts you to make the number and types of measurements required by the volume method that you have selected.
6. Use the trackball, the **AREA**, **DISTANCE**, **DEL MEAS**, and the **SELECT** controls to perform the measurements required for the volume method selected.
7. The results of each measurement and the results of the volume calculation will be displayed when you have performed the required measurements (Figure 6-6).
8. At this point you can:
 - Press the **CALCS** control to store the measurements into a patient report.
 - Press the **DEL MEAS** control to erase the measurement cursors and results.
 - Press the **FREEZE** control to erase the measurements and resume imaging.

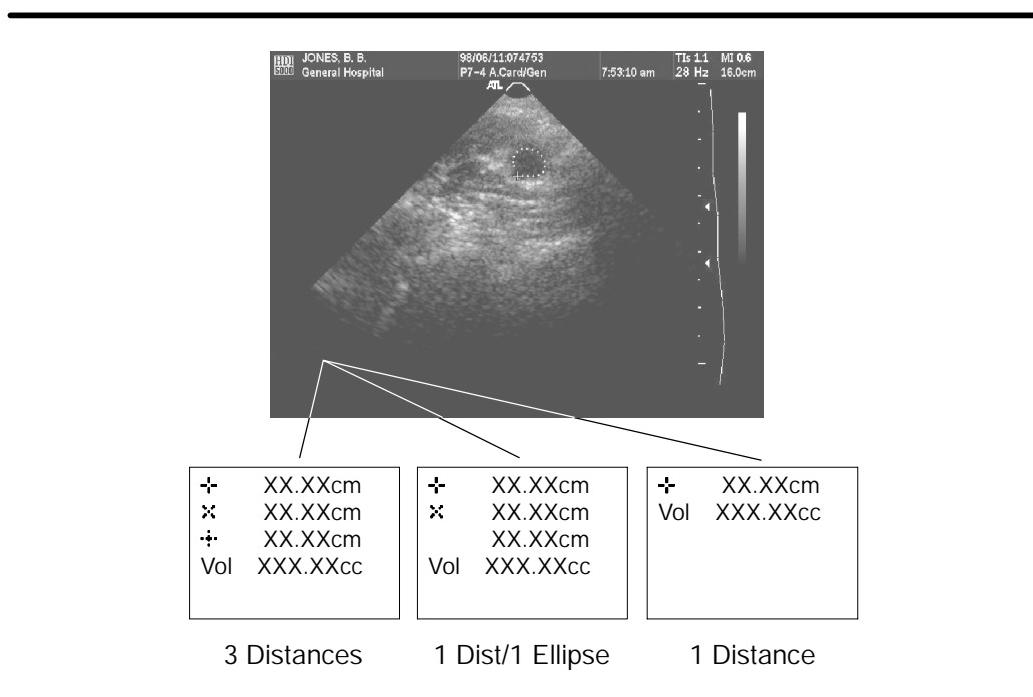


Figure 6-6. 2D Volume Measurement: Results (All methods shown)

Measuring M-Mode Distance

During an M-mode measurement, the measurement cursors may be moved to the 2D display, and a 2D distance measurement can be performed.

To ensure display integrity for analysis and measurement, the M-mode display scale must correspond to the M-mode data display. For this reason, the M-mode display data is auto-

Making Measurements

matically cleared from the screen whenever certain control settings are changed. Similarly, the M-mode review memory buffer is cleared.

Making Measurements

" To measure distance on an M-mode trace:

1. Obtain the desired M-mode display.
2. Press the **FREEZE** control.
3. Press the **DISTANCE** control. A vertical time line and a horizontal cursor appear on the M-mode display (Figure 6-7).
4. Use the trackball to move the time line and the cursor to the position at which you want to begin the distance measurement. (Moving the trackball up and down moves the cursor; moving the trackball side-to-side moves the time line.)

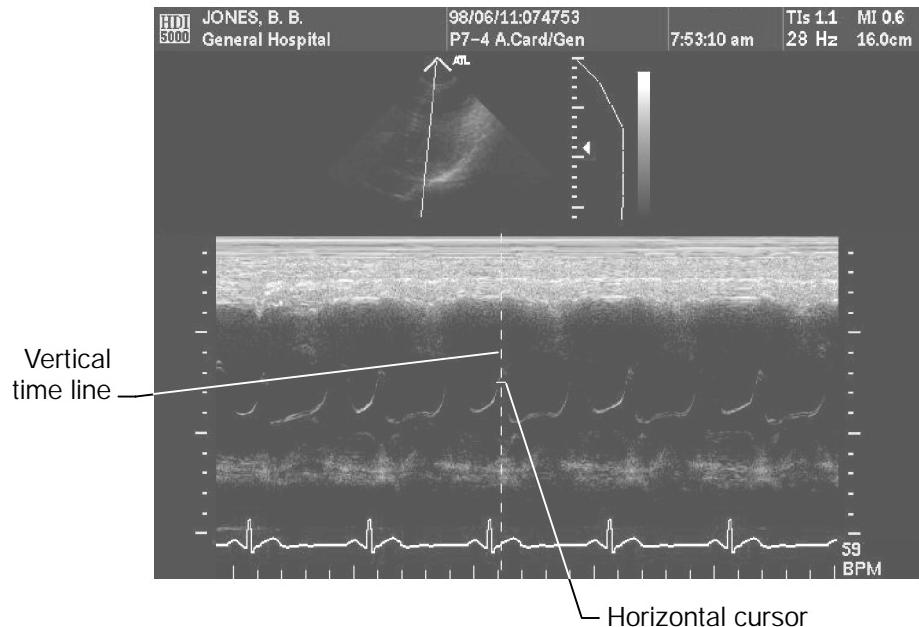


Figure 6-7. M-Mode Distance Measurement

5. Press the **SELECT** control. A second horizontal cursor appears on the time line, and the time line disappears. The distance between the two cursors is displayed in the results.
6. Move the second cursor to the desired position. The distance between the cursors is continually updated in the results.
7. To perform up to six measurements along the same time line, press the **SELECT** control to display additional cursors, and use the trackball to position them (Figure 6-8).

Making Measurements

8. To perform up to six measurements along different time lines, press the **DISTANCE** control to display successive time lines, and use the trackball and **SELECT** to position the time line cursors (Figure 6-9).
 9. At this point you can:
 - Press the **DEL MEAS** control to erase individual measurement cursors and results until all are erased.
 - Press the **CALCS** control to store the measurement values into a patient report.
 - Press the **FREEZE** control to erase the measurement and resume imaging.
-

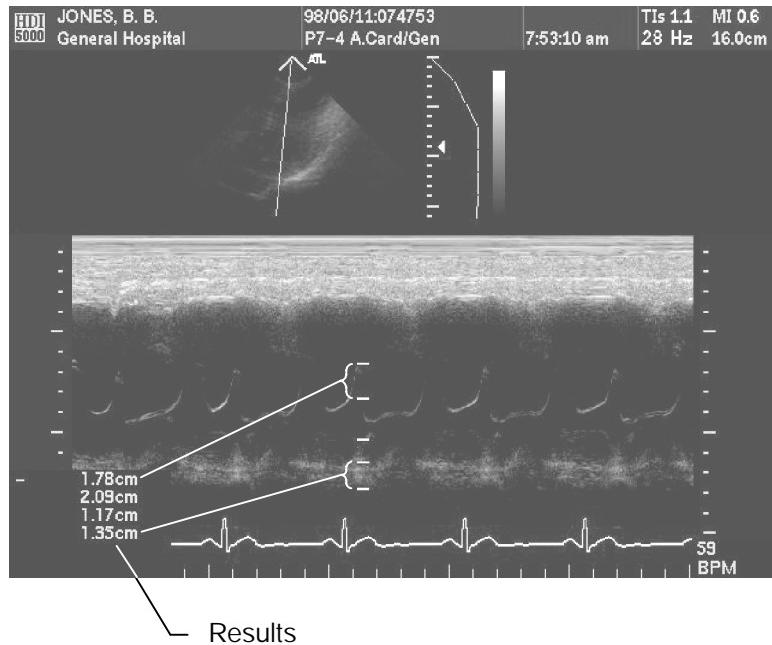


Figure 6-8. Multiple M-Mode Distance Measurements: Same Time Line

Making Measurements

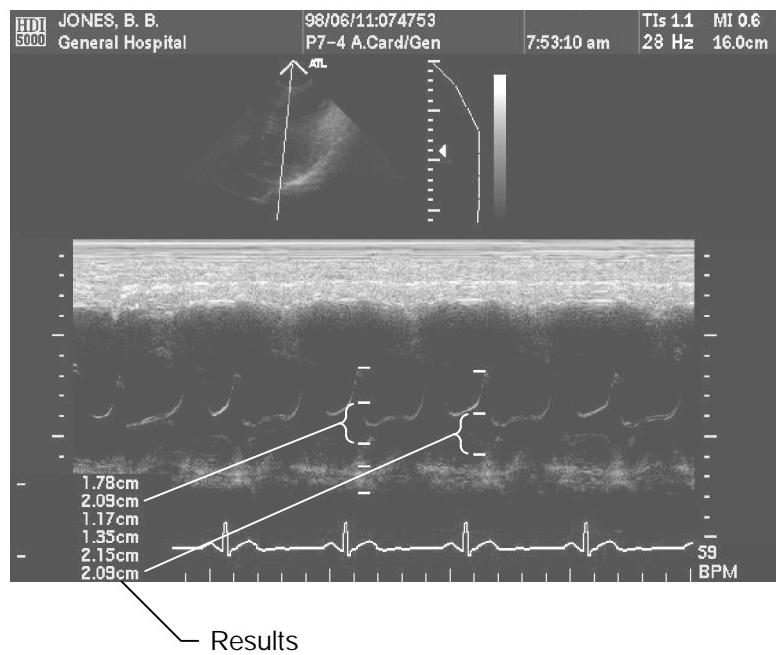


Figure 6-9. Multiple M-Mode Distance Measurements: Different Time Lines

Measuring Doppler Distance

You may want to check your **Measurements** setups before performing the following procedures. You may want to set the Doppler area method for your area measurements: **Continuous Trace** and **Trace By Points** are available. You will want to set your **Doppler Results Display** in the **Measurements** setups.

To ensure display integrity for analysis and measurement, the Doppler display scale must correspond to the Doppler data display. For this reason, the Doppler display data is automatically cleared from the screen whenever certain control settings are changed. Similarly, the Doppler review memory buffer is cleared.

- " **To perform a Doppler distance measurement on a live Doppler display:**
 1. Obtain the desired Doppler display.
 2. Press the **DISTANCE** control to display the measurement cursor (a dashed horizontal line) parallel to the baseline ([Figure 6-10](#)).
 3. Use the trackball to move the measurement cursor up or down. The line provides a way to more easily determine velocity or frequency values relative to the Doppler scale. (Results are not displayed.)
 4. At this point you can:
 - Press the **DEL MEAS** control to remove the measurement cursor.
 - Press the **FREEZE** control and perform measurements on a frozen Doppler display. Refer to "[To perform a Doppler distance measurement on a frozen Doppler display](#)."

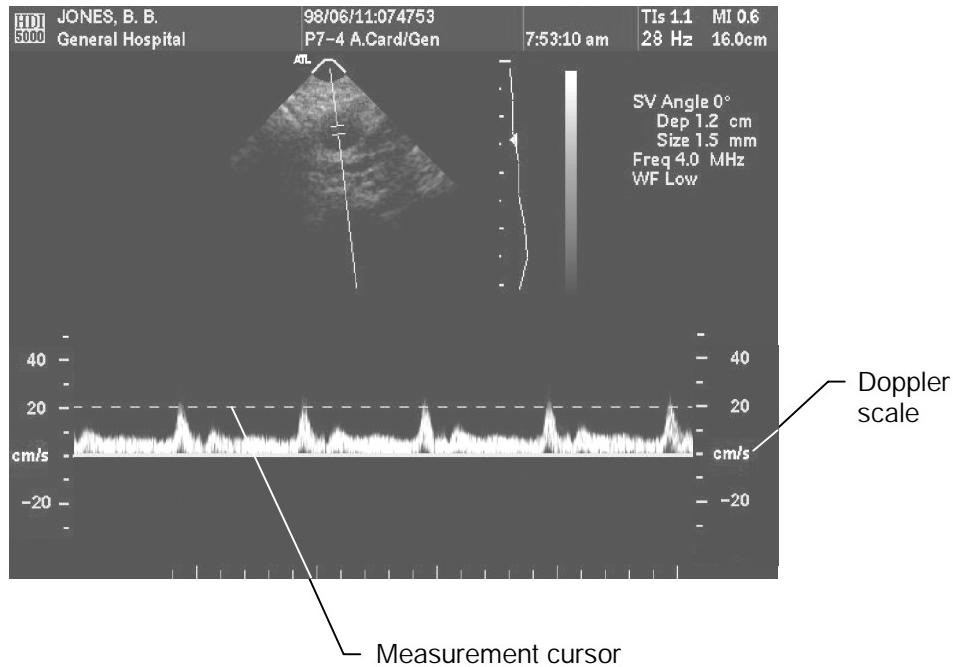


Figure 6-10. Doppler Distance Measurement: Live Doppler Display

- " To perform a Doppler distance measurement on a frozen Doppler display:
 1. If you have not already done so, obtain the desired Doppler display.
 2. If you have not already done so, press the **FREEZE** control.
 3. Press the **DISTANCE** control to display a measurement cursor and results. The results contain the distance between the cursor and the Doppler baseline in frequency or velocity units.
 4. Use the trackball to move the measurement cursor. The velocity or frequency results are continually updated. (You can also move the cursor into the 2D display and perform a 2D distance measurement at this point.)

Making Measurements

5. Press the **SELECT** control to display the second measurement cursor of a pair of measurement cursors (Figure 6-11). The results now contain the velocity or frequency values of the two cursors relative to the baseline and any relevant Doppler display results.
-

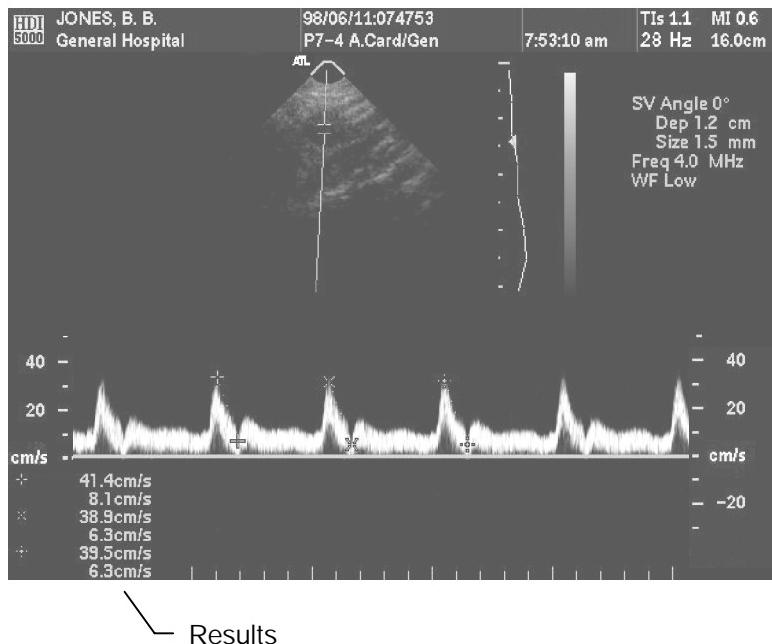


Figure 6-11. Doppler Distance Measurement: Showing Pairs of Cursors (Frozen Display)

6. Use the trackball to move the second measurement cursor.
7. Press the **SELECT** control to alternate control between the cursors, and use the trackball to adjust the positions of the cursors.
8. Once you are satisfied with the locations of the cursors, the measurement is complete. The velocity or frequency values of the two cursors relative to the baseline and any Doppler display results are included in the results.
9. At this point you can:
 - Press the **FREEZE** control to end the measurement, remove the measurement cursors and results, and resume live Doppler imaging.
 - Press the **DISTANCE** control to display a different initial cursor of a pair of associated single cursors (Figure 6-12).

Making Measurements

- Press the **DEL MEAS** control to erase the last measurement, and press the **DEL MEAS** control again to delete all measurements.

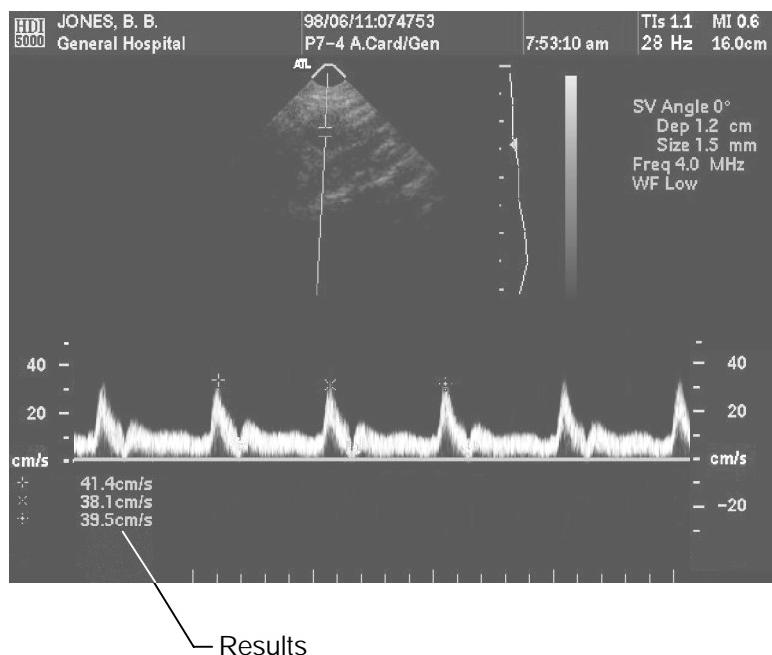


Figure 6-12. Doppler Distance Measurement: Single Cursors (Frozen Display)

Making Measurements

- " To select a Doppler area method:

For General Imaging clinical options, the Doppler area method is selected in the **Display** setups. For Cardiology clinical options, perform the following.

1. Press the **AREA** control.
 - A cursor appears on the display.
 - A 5-second prompt shows the current Doppler area method (Figure 6-13).
2. To change the Doppler area method, press the **AREA** control to alternate between the two Doppler area methods: **Continuous Trace** and **Trace By Points**.
3. Perform the measurement with the area method selected. See the following procedures for detailed instructions for each area method.

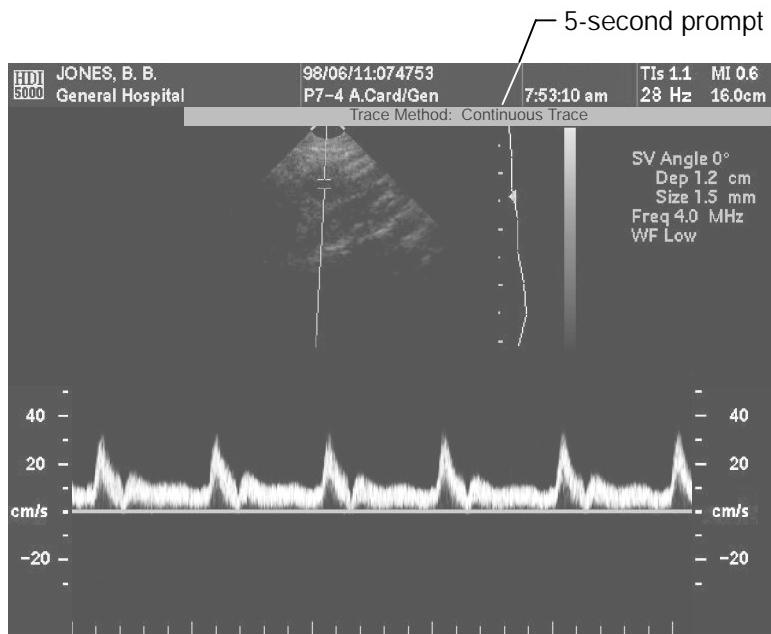


Figure 6-13. Doppler Area Method: 5-second Prompt

- " To perform a Doppler continuous trace area measurement:

1. Obtain the desired Doppler display.
2. Press the **FREEZE** control.

Note If you press the **AREA** control, before pressing the **FREEZE** control, a dashed horizontal line appears along and parallel to the baseline. You can use the trackball to move this line up and down. The line provides a way to more easily determine velocity or frequency values relative to the Doppler scale.

3. Press the **AREA** control. A cursor appears on the Doppler display, and a prompt appears above the 2D display.
4. Use the trackball to move the cursor to the start of the Doppler measurement.
5. Press the **SELECT** control to start the measurement and to display a second cursor.
6. Use the trackball to move the second cursor along the Doppler display to trace the Doppler waveform.
7. If required, press **DEL MEAS** to erase the last segment or segments of the trace.
8. When the last point on the Doppler waveform has been traced, press the **AREA** control ([Figure 6-14](#)) to display the results. The values displayed depend upon the results selected in the **Doppler Results Display** in the **Measurements** setups.
9. At this point you can:
 - Press the **AREA** control to perform another continuous trace measurement. (Only one area measurement can be displayed at one time.)
 - Press the **CALCS** control to store the measurement values into a patient report. (If you press the **CALCS** control before closing the trace, then the trace closes and the **CALCS** menu appears.)
 - Press the **FREEZE** control to erase the measurement and resume imaging.
 - Press the **DEL MEAS** control to erase the measurement cursors and results.

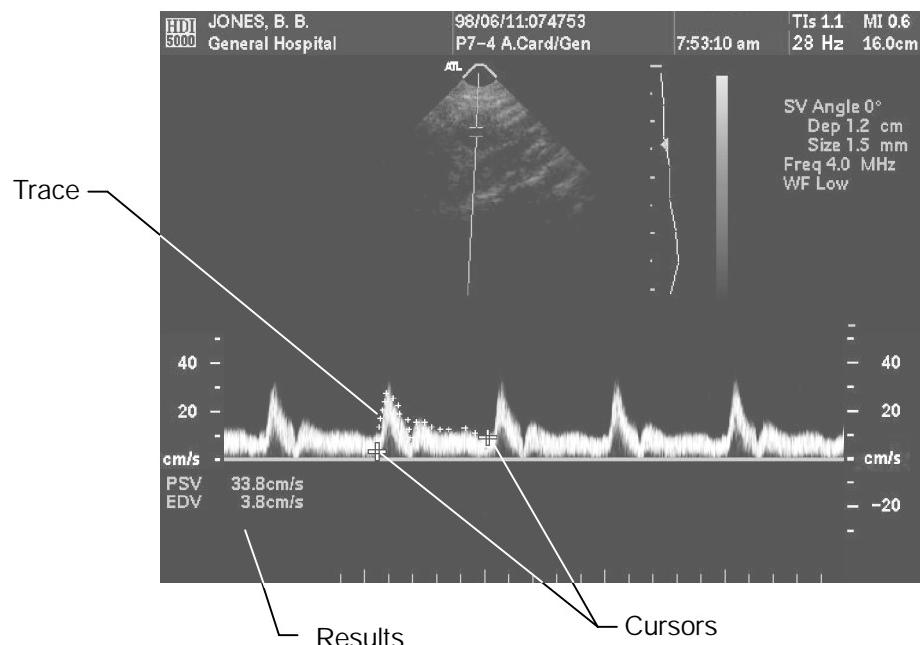


Figure 6-14. Doppler Area: Continuous Trace Results

- " To perform a Doppler trace-by-points area measurement:
 1. Obtain the desired Doppler display.
 2. Press the **FREEZE** control.

Note If you press the **AREA** control, before pressing the **FREEZE** control, a dashed horizontal line appears along and parallel to the baseline. You can use the trackball to move this line up and down. The line provides a way to more easily determine velocity or frequency values relative to the Doppler scale.

3. Press the **AREA** control to display a cursor on the Doppler.
4. Use the trackball to move the cursor to the start of the measurement.
5. Press the **SELECT** control to fix the position of the cursor and display a second cursor.
6. Use the trackball to move the cursor to the next point on the Doppler waveform.
7. Press the **SELECT** control. A straight line is drawn between the two points.
8. Repeat steps 6 and 7 until the Doppler waveform is traced. Ensure that you end your trace at the onset of systole.

Making Measurements

9. If required, press **DEL MEAS** to erase the last segment of the trace.
 10. When the last point on the Doppler display has been marked, press the **AREA** control to display the results. The values displayed depend upon the parameters selected in the **Doppler Results Display** in the **Measurements** setups (Figure 6-15).
 11. At this point you can:
 - Press the **AREA** control twice to perform another trace-by-points measurement. (Only one area measurement can be displayed at one time.)
 - Press the **CALCS** control to store the measurement values into a patient report. (If you press the **CALCS** control before closing the trace, then the trace closes and the **CALCS** menu appears.)
 - Press the **FREEZE** control to erase the measurement and resume imaging.
 - Press the **DEL MEAS** control to erase the measurement cursors and results.
-

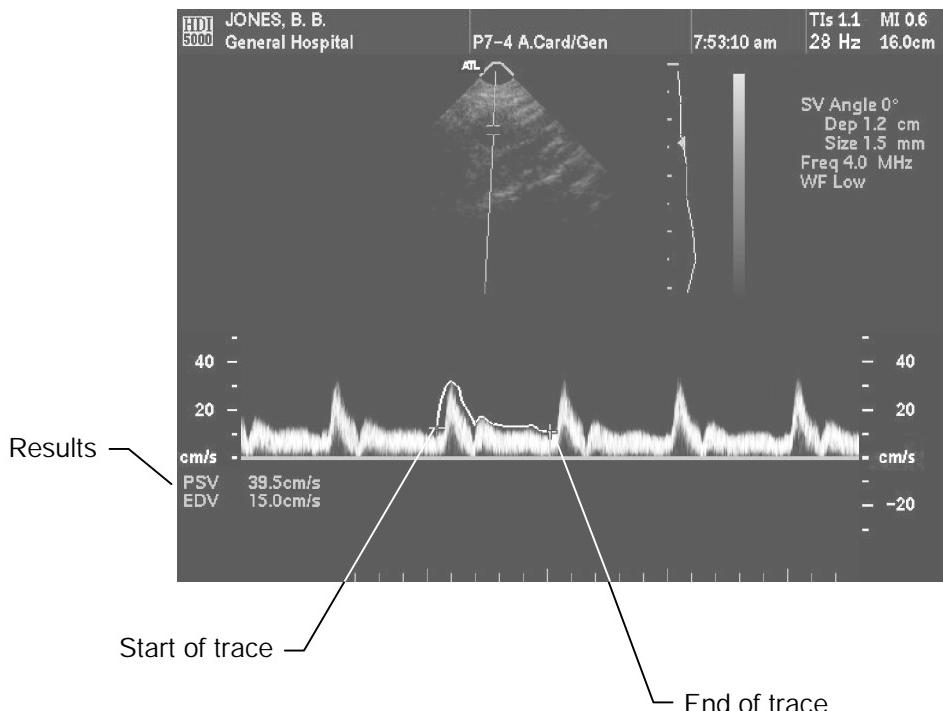


Figure 6-15. Doppler Area: Trace-by-Points Results

Measuring Time/Slope

" To perform a time/slope measurement:

1. Acquire the scrolling display that you want to measure.
2. Press the **FREEZE** control.
3. Press the **ADV MEAS** control to display the **Meas Tools** menu.
4. Select **Time/Slope** on the **Meas Tools** menu. A time line and a cursor appear on the frozen scrolling display.
5. Move the time line and the cursor to the point at which you want to begin the time/slope measurement.
6. Press the **SELECT** control. The first cursor is fixed. A second cursor appears along the time line, and a solid line connects the two cursors ([Figure 6-16](#)).
7. Use the trackball to position the time line and position the cursor along the time line. (Moving the trackball up and down moves the cursor; moving the trackball side-to-side moves the time line.) The results of the time/slope measurement are continually updated as the cursor, the time line, or both are moved.
8. Press the **SELECT** control, as necessary, to alternate the location of the time line, and adjust the measurement.
9. At this point you can:
 - Press the **CALCS** control to store the measurement values into a patient report.
 - Select **Time/Slope** from the **Meas Tools** menu to start another time/slope measurement. You can display two time/slope measurements at once.
 - Press the **FREEZE** control to erase the measurement and resume imaging.
 - Press the **DEL MEAS** control to erase individual measurement cursors and results until all are erased.

Making Measurements

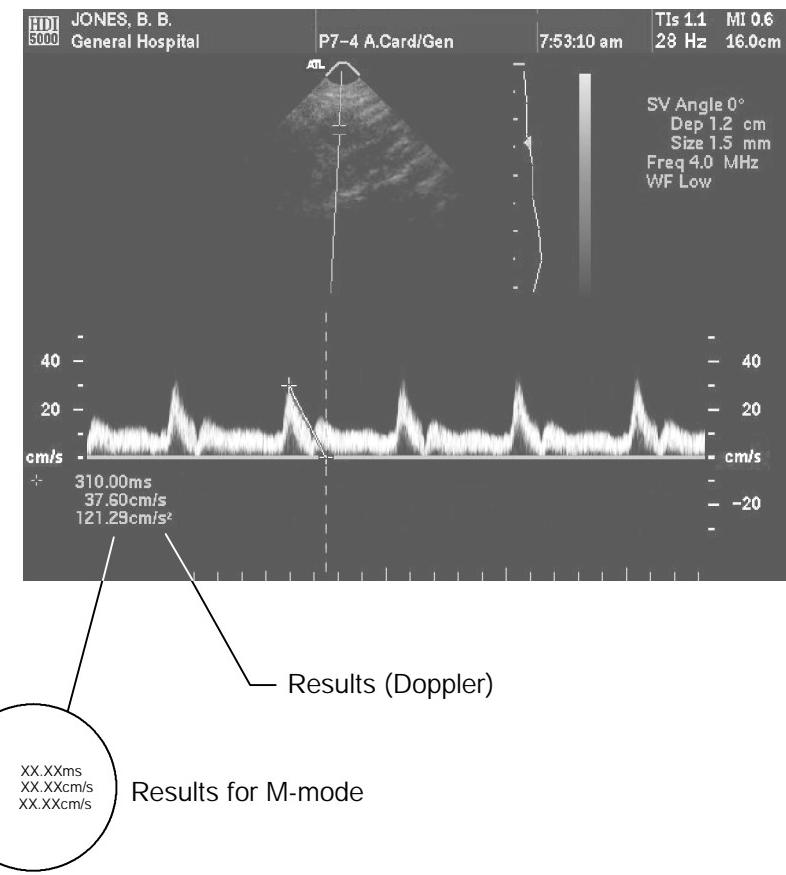


Figure 6-16. Time/Slope Measurement Results

Measuring Heart Rate

" To measure the heart rate:

1. Acquire the desired scrolling display.
2. Press the **FREEZE** control.
3. Press the **ADV MEAS** control to display the **Meas Tools** menu.
4. Select **Heart Rate**. A vertical line cursor appears on the frozen scrolling display, extending through the scrolling display to the time line.
5. Use the trackball to position the cursor at a point in the heart cycle.
6. Press the **SELECT** control to fix the cursor position. A second cursor appears on the display.
7. Use the trackball to move the cursor to an equivalent point in the next heart cycle. The heart rate, in bpm, appears in the results and updates as cursors are moved or averaged into the results ([Figure 6-17](#)).
8. Continue to press **SELECT** and use the trackball to measure additional heart cycles. The results, in bpm, are the average of the intervals that you measure.
9. At this point you can:
 - Press the **CALCS** control to store the measurement values into a patient report.
 - Press the **FREEZE** control to erase the measurement and resume imaging.
 - Press the **DEL MEAS** control to erase individual measurement cursors and results until all are erased. The bpm results are adjusted accordingly.

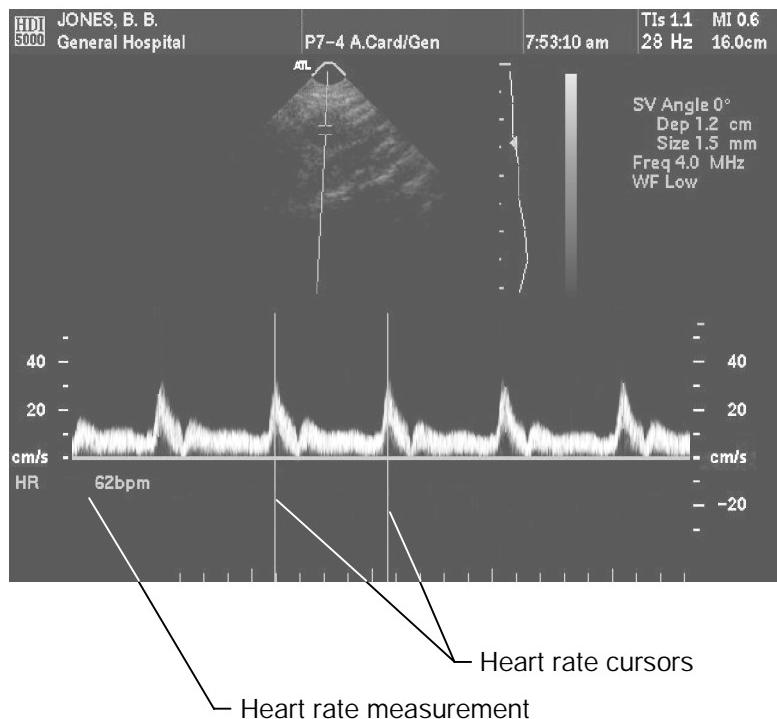


Figure 6-17. Heart Rate Measurement (M-Mode Shown)

Measuring Recorded or Stored Images

Anytime that you attempt to measure a recorded image (a VCR freeze-frame) or stored image, the system requires certain information about the image. The process by which you provide this information to the system is called calibration. The system provides messages and dialog boxes to guide you through the calibration procedure. You can also accept a previous calibration.

- " To select the Calibrate measurement tool:
 1. Press the **ADV MEAS** control.
 2. Select **Calibrate** to display the **Select Display** (Figure 6-18).
-

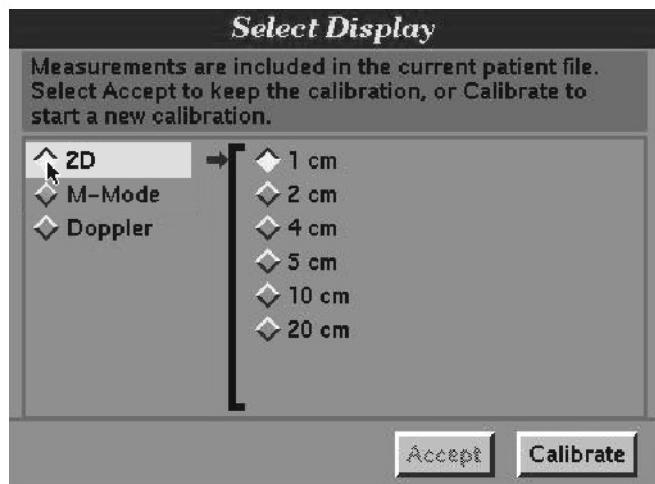


Figure 6-18. Select Display: 2D Calibration

- " To calibrate an image for measurement:
 1. If you attempt to measure a recorded or stored image, the **Select Display** automatically appears. You can accept the current calibration, or you can choose to calibrate. Proceed with step 2, if you select **Calibrate** on the **Select Display**.
 2. Select **2D**, **M-Mode**, or **Doppler**, depending upon the type of image you want to measure. The parameters for the type of image appear:
 - Depth for a 2D frame (Figure 6-18)
 - Depth and time for an M-mode frame ([Figure 6-19](#))
 - Type, orientation, time, and velocity or frequency for a Doppler frame ([Figure 6-20](#)).

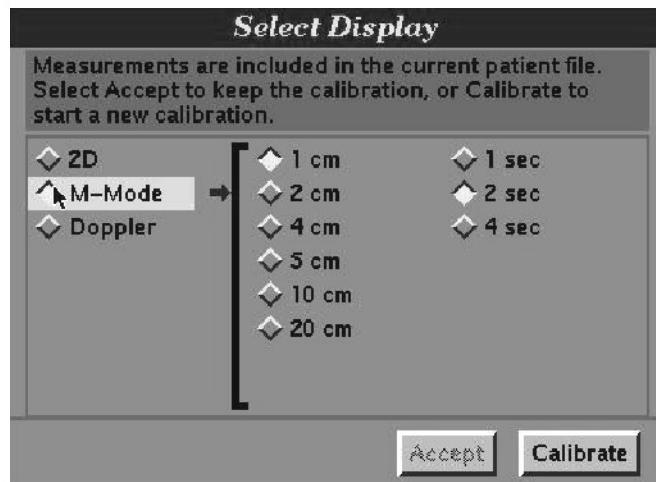


Figure 6-19. M-Mode Calibration

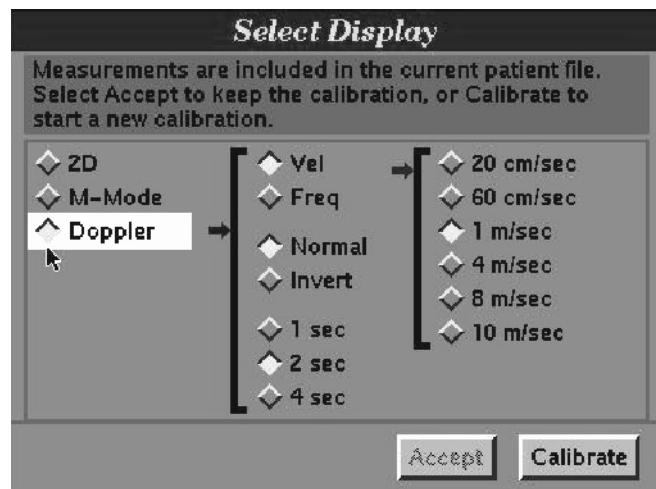


Figure 6-20. Doppler Calibration

3. Select the calibration values that you want for the type of frame you have selected in [step 2](#). The largest calibration value that will fit in the scale is the best value to use for the calibration. For example: if you are displaying a depth of 15 cm in the image, then the **10 cm** calibration value will provide the most accurate calibration and, therefore, the most accurate measurement.

Making Measurements

4. Use the trackball to move the calibration cursors and use the **SELECT** control to set them. Use the depth scale, the time scale, the frequency, or the velocity scales as appropriate for a scale by which to position the calibration cursors. The separation between the cursors along the scale that you use must correspond to the calibration values selected in [Step 3](#). The system draws a line between the two cursor positions (Figure 6-21). The image is calibrated and ready for measurement.
-

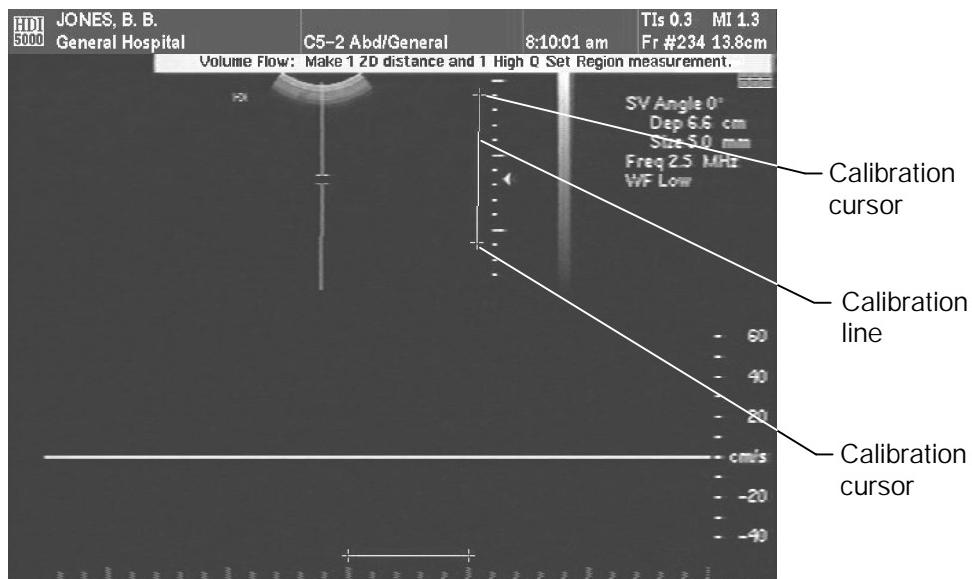


Figure 6-21. Calibrate

" **To measure a calibrated image:**

Measure the calibrated image, as required, using the measurement tools and procedures described in this manual.

High Q Automatic Doppler Measurement

High Q automatic Doppler measurement refers to the automatic calculation and display of values for specified Doppler parameters. You specify which Doppler parameters will be displayed. This is done in the **Measurement** setups. The results can be obtained from a frozen display over a specified region of interest or the results can be obtained on a scrolling Doppler display on a real-time basis.

For accurate measurements, optimize the Doppler display as follows:

- The sample volume is centered in the vessel.
- Avoid measurements during simultaneous mode. Calculations derived from data obtained during simultaneous mode will compromise the accuracy of the High Q automatic calculations and the results.
- The spectral display does not exhibit aliasing.
- The angle correction cursor is parallel to the direction of flow.

" To turn on the Mean Trace (for General Imaging clinical options):

1. Press the **ADV MEAS** control to display the **Meas Tools** menu.
2. Select **Mean Trace** (the Doppler display must be scrolling to make the trace selection) to turn on the **Mean Trace**.
3. Highlight **Trace** on the **Meas Tools** menu. (The Doppler display must be scrolling to make this selection.)
4. Press the **SELECT** control until the area that you wish to include in the mean trace is displayed. The available selections are up, down, or all. (This selection also applies to the peak trace.)
5. Obtain an optimal Doppler display.

The Doppler display mean tracing automatically occurs. (The mean trace is black; the peak trace is blue.)

" To obtain High Q Doppler display results on a scrolling display:

1. Make the appropriate selections for the **Doppler Results Display** and the High Q update interval in **Measurements** setups based on your application.
2. Obtain an optimal Doppler display.
3. Press the **HIGH Q®** control. The Doppler display peak tracing occurs. (The peak trace is blue; the mean trace is black.) The parameters that you selected in the **Doppler Results Display** will update in the results box based on the number of heart cycles you selected ([Figure 6-22](#)).

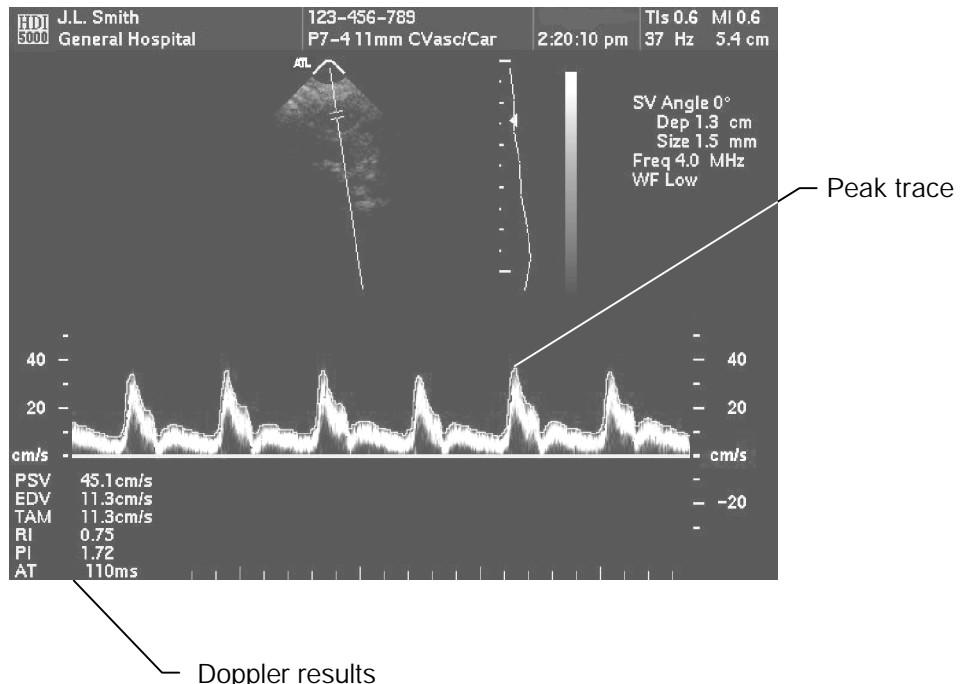


Figure 6-22. High Q Automatic Doppler Results and Peak Trace

“ To set a region for High Q automatic Doppler measurement:

Read the information about High Q measurement in the “Measurements” section of the *Reference Manual*.

1. Make the appropriate selections for the **Doppler Results Display** and the High Q update interval in **Measurements** Setups.
2. Obtain an optimal Doppler display.
3. Press the **HIGH Q®** control. The Doppler display peak tracing automatically occurs (the peak trace is blue), and the Doppler results automatically update based on your setups. (You can also perform this step after pressing the **FREEZE** control.)
4. Press the **FREEZE** control.
 - For general imaging clinical options, press the **ADV MEAS** control and select **Set Region** ([Figure 6-23](#)).
 - For cardiology clinical options, two vertical line cursors appear on the Doppler display ([Figure 6-24](#)).
5. Position the first cursor at the onset of systole of the first heart cycle.

Making Measurements

6. Press the **SELECT** control.
7. Position the second cursor. Ensure that at least two systolic peaks are included in the region of interest.
8. Press the **SELECT** control to alternate between the cursors and adjust the cursor positions.

The values for the parameters defined in the **Measurements** setups will be displayed for the region defined.

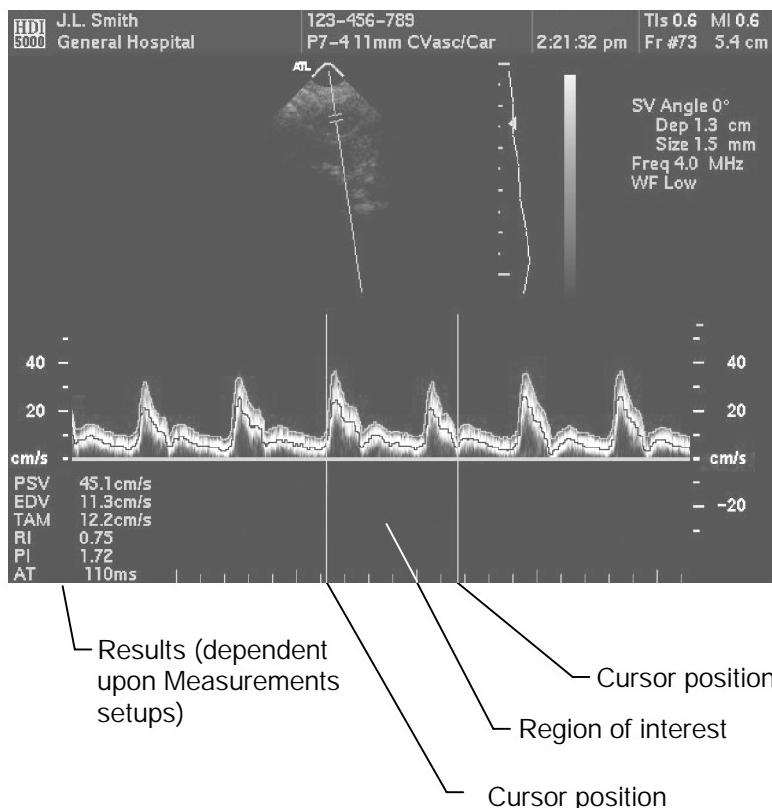


Figure 6-23. Set Region: General Imaging

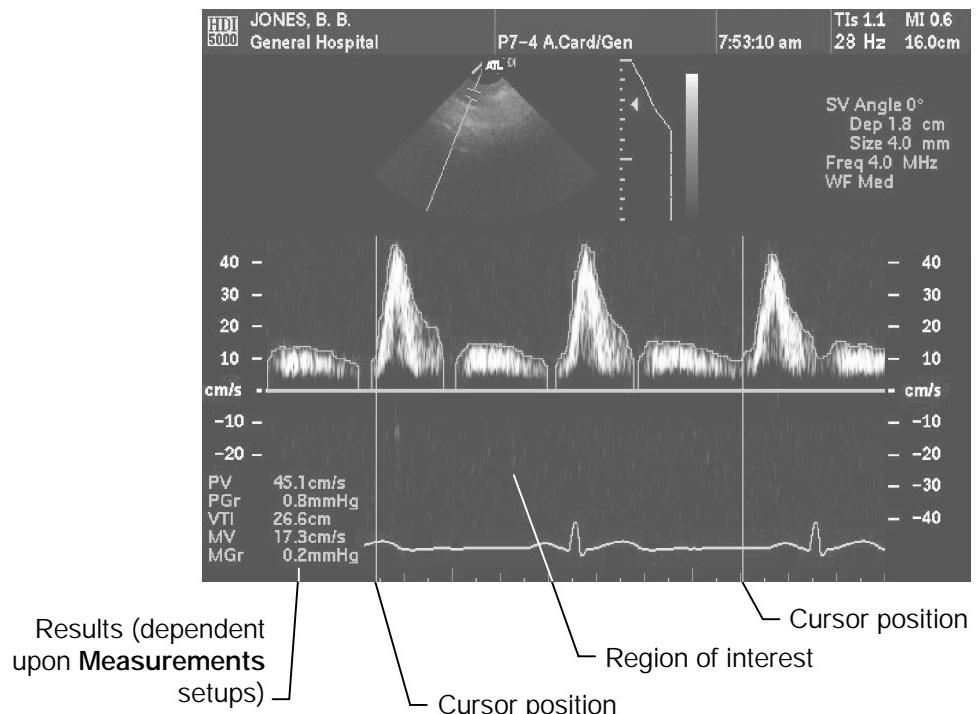


Figure 6-24. Set Region: Cardiology

Volume Flow

The volume flow measurement tool calculates volume flow for non-cardiology clinical options, using a 2D distance measurement and a High Q time-averaged mean velocity measurement. The volume flow calculation can be obtained from a frozen display or from a real-time display. The Doppler scaling must be in velocity units. Diameter bar measurements are constrained to a line that is perpendicular to and passes through the center of the angle correction cursor.

" **To measure volume flow:**

2D Measurement

1. In 2D-only imaging or Doppler imaging, acquire a 2D image that displays a longitudinal view of the vasculature under study.
2. Press the **ADV MEAS** control.
3. Select **Vol Flow**. The system automatically does the following:
 - Deletes existing measurement tools.
 - Turns on the High Q mean trace.
 - Turns off the High Q peak trace.
 - Displays the D-line and sample volume cursor and angle correction cursor in 2D-only imaging mode.
 - Sets the **High Q** control to control the mean trace.
4. Press the **DISTANCE** control. The first cursor of the diameter bar appears on the 2D display.
5. On the 2D display, use the trackball to position the cursor on one side of the vessel diameter.
6. Press the **SELECT** control to fix the position of the first cursor and display the second cursor of the diameter bar ([Figure 6-25](#)).

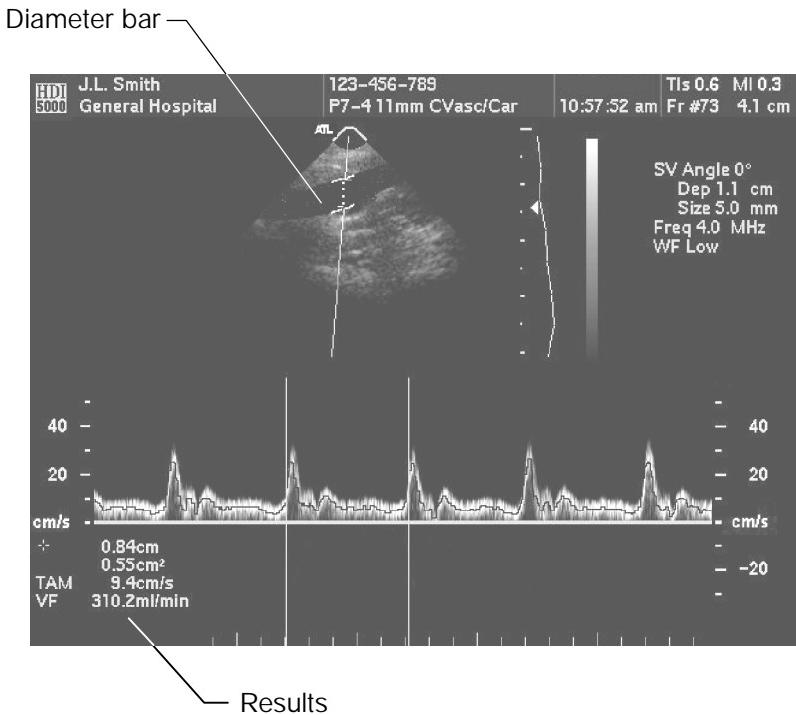


Figure 6-25. Volume Flow: Diameter Bar Measure

7. Position the other cursor of the diameter bar on the other side of the vessel diameter. The two cursors define the diameter of the vessel.
8. Press the **SELECT** control to end the 2D diameter measurement. The diameter bar cannot be repositioned; a new 2D diameter measurement must be started to make an adjustment. (To start a new 2D measurement, press the **DISTANCE** control.)

Doppler Measurement

9. Position the sample volume cursor within the area of flow on the 2D image and obtain a Doppler trace. The volume flow calculation based on the real-time TAM velocity is displayed in the results (Figure 6-25).
10. To define a specific region for volume flow calculations, press the **FREEZE** control to display two vertical cursors. To scroll back through the Doppler review memory:
 - a. Press the **High Q** control to turn off the mean trace.
 - b. Use the trackball to move through the Doppler review memory.
 - c. Press the **High Q** control to display the mean trace and the vertical cursors again.

11. Use the trackball and the **SELECT** control to define a region for volume flow calculation.

Cardiac Output (CO)

The cardiac output measurement tool calculates cardiac output and stroke volume for cardiology clinical options, using a 2D distance measurement, a velocity time integral (VTI) measurement, and a heart rate measurement from the same heart cycle as the VTI measurement. When the High Q Automatic Doppler feature is on, the peak velocity and heart rate are displayed when there is a frozen or real-time display. Diameter measurements are averaged.

- " **To measure cardiac output:**

2D Measurement

1. In 2D-only imaging or Doppler imaging, acquire a 2D image that displays the vasculature under study.
2. Press the **ADV MEAS** control.
3. Select **CO**. The system automatically does the following:
 - Deletes existing measurement tools.
 - Turns on the High Q peak trace.
4. Press the **DISTANCE** control. A first cursor of the diameter bar appears on the 2D display.
5. On the 2D display, use the trackball to position the cursor on one side of the vessel diameter.
6. Press the **SELECT** control to fix the position of the first cursor and display the second cursor of the diameter bar.
7. Position the other cursor of the diameter bar on the other side of the vessel diameter. The two cursors define the diameter of the vessel.
8. Press the **SELECT** control to end the 2D diameter measurement. The diameter bar cannot be repositioned; a new 2D diameter measurement must be started to make an adjustment.

Doppler Measurement

9. Position the sample volume cursor within the area of flow on the 2D image and obtain a Doppler trace.
10. Press the **FREEZE** control to display two vertical cursors. To scroll back through the Doppler review memory:
 - a. Press the **High Q** control to turn off the peak trace.

Making Measurements

- b. Use the trackball to move through the Doppler review memory.
- c. Press the **High Q** control to display the peak trace and the vertical cursors again.
11. Use the trackball and the **SELECT** control to define a region for cardiac output, stroke volume, peak velocity, and heart rate calculations (Figure 6-26).
12. To adjust the measurement, use the trackball and **SELECT** control to move the cursors. The cardiac output results will be recalculated based on the new cursor positions.

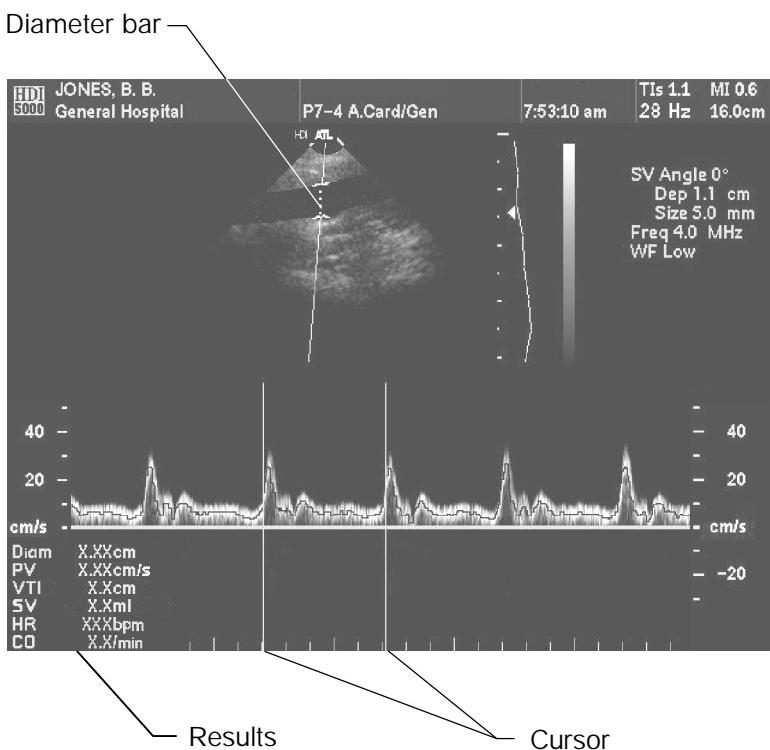


Figure 6-26. Cardiac Output Calculation and Results

Deleting Measurements

- " To delete measurements:
 1. Press the **DEL MEAS** control to remove the current measurement from the display.
 2. Press the **DEL MEAS** control a second time to delete all measurements from the display.

Optional Measurement Tools

" To perform a hip angle measurement:

1. Obtain an image of the infant hip at the trochanter major, and press the **FREEZE** control.
2. Press the **ADV MEAS** control. The **Meas Tools** menu is displayed.
3. Select **Hip Angle** to begin the hip angle measurement. A prompt appears above the 2D image ([Figure 6-27](#)): "Use the distance tool, measure the Baseline, the Inclination Line, and then the Roof Line."
4. Press the **DISTANCE** control to display a measurement cursor.
5. To locate the first point of the baseline, move the cursor to the osseous acetabular convexity.
6. Press the **SELECT** control.
7. To locate the second point, move the end of the baseline to the point where the joint capsule and the perichondrium unites with the iliac bone ([Figure 6-27](#)). The **SELECT** control can be used to alternate between control of the two measurement cursors to make adjustments.
8. Press the **DISTANCE** control to display a measurement cursor..
9. To locate the first point on the inclination line, move the cursor to the osseous acetabular convexity.
10. Press the **SELECT** control.
11. To locate the second point on the inclination line, move the end of the inclination line to the labrum acetabulare ([Figure 6-27](#)).
12. Press the **DISTANCE** control. A measurement cursor appears.
13. To locate the first point of the roof line, move the cursor to the lower edge of the os ilium.
14. Press the **SELECT** control.
15. To locate the second point of the roof line, move the end of the roof line to the osseous acetabular convexity ([Figure 6-27](#)).
16. Press the **SELECT** control. The values of the alpha and beta angles are calculated and displayed ([Figure 6-27](#)).

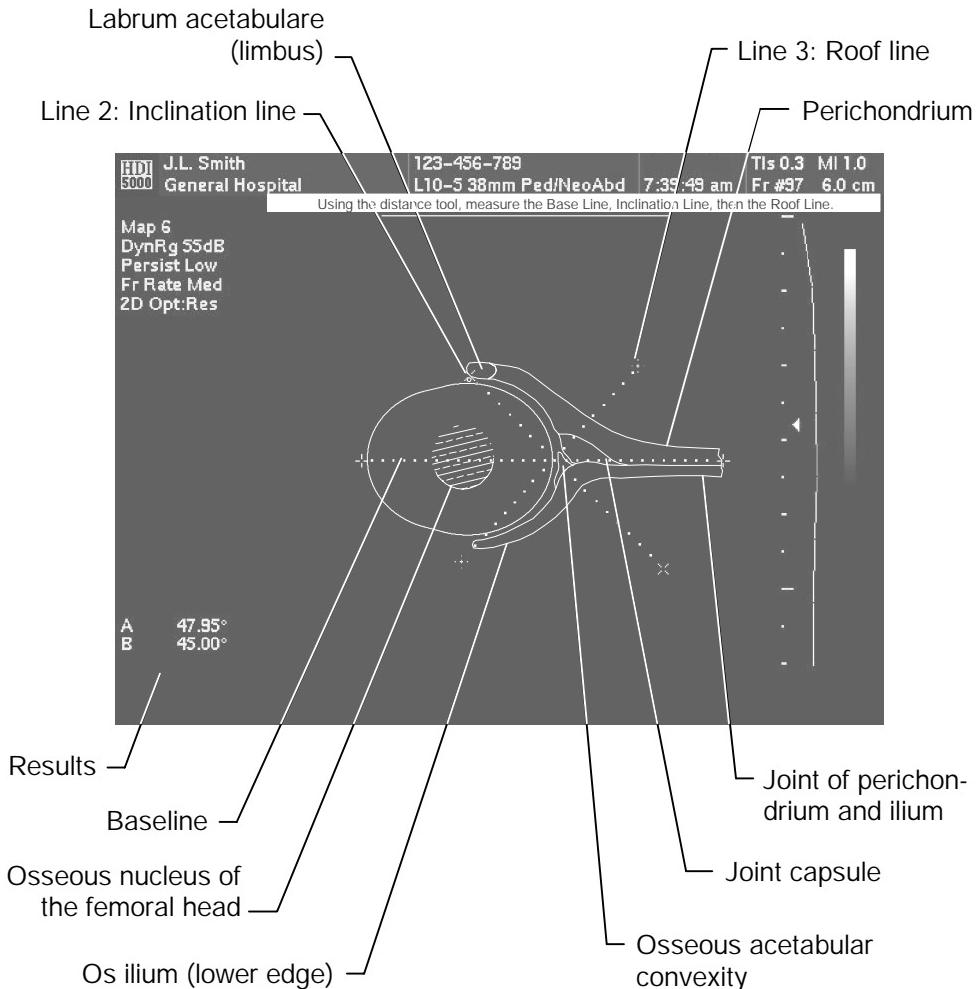


Figure 6-27. Hip Angle: Alpha and Beta Angle Results

- " To obtain a d:D ratio:

1. Obtain an image of the infant hip at the trochanter major, and press the **FREEZE** control.
2. Press the **ADV MEAS** control. The Meas Tools menu appears.
3. Select **d:D Ratio** to begin the d:D Ratio measurement. A prompt appears above the 2D image: "Measure the circumference of the femoral head, then the Base Line."
4. Press the **AREA** control, and use the ellipse method to measure the circumference of the femoral head. (The ellipse method in this case is limited to a circle.)
5. Move the cursor to the center of the femoral head ([Figure 6-28](#)).
6. Press the **SELECT** control.
7. Use the trackball to adjust the size of the ellipse to outline the femoral head ([Figure 6-28](#)).
8. Press the **SELECT** control.
9. Use the trackball to adjust the size of the ellipse.
10. As necessary, press the **SELECT** control and use the trackball to alternately adjust the size and location of the ellipse until you are satisfied with the measurement.
11. Press the **DISTANCE** control to display a measurement cursor.
12. Move the cursor to a point at the end of a line running along the ilium and through the femoral head ([Figure 6-28](#)).
13. Press the **SELECT** control.
14. Move the cursor to a point at the other end of the line running along the ilium and through the femoral head. Once the baseline approaches the boundaries of the ellipse, the diameter of the femoral head appears on the display.
15. As you move the baseline radially, the d:D ratio is adjusted and displayed in the results. The value of the d:D ratio is calculated and displayed ([Figure 6-28](#)).

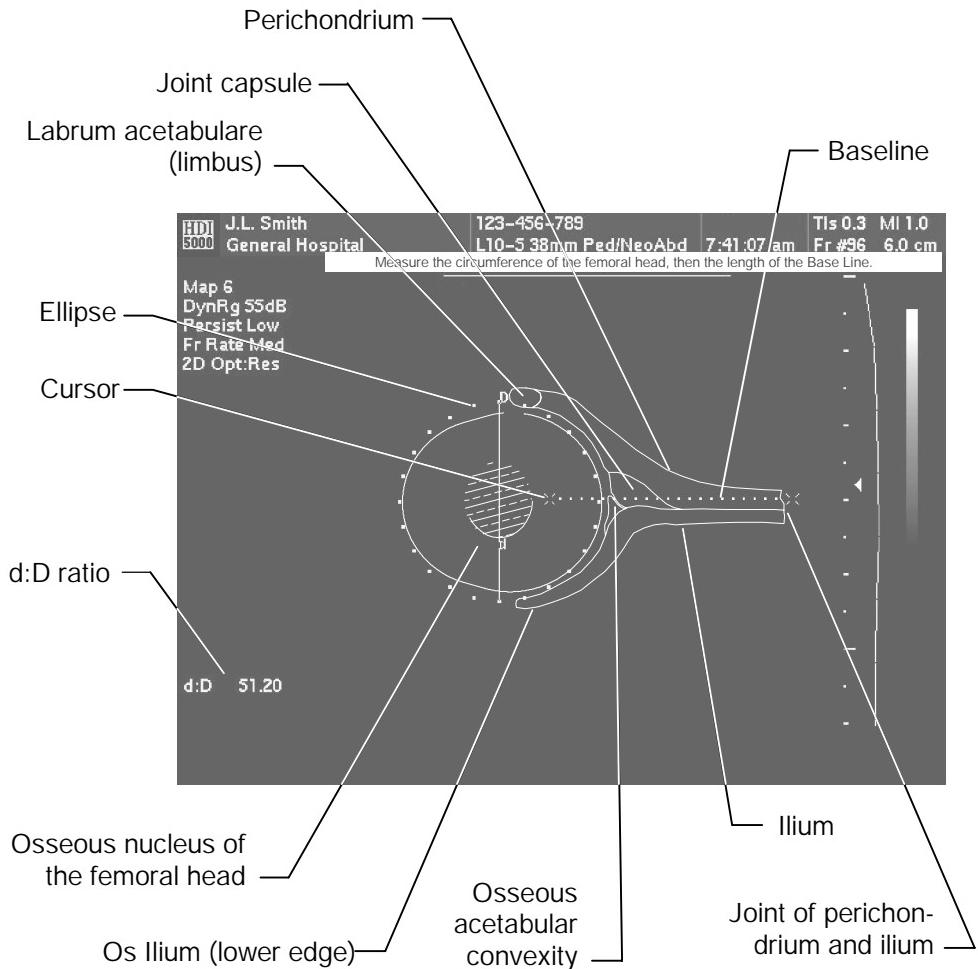


Figure 6-28. d:D Ratio: Baseline

- " To obtain the percent diameter reduction:

1. Obtain a 2D image that displays a longitudinal view of the vasculature under study.
2. Press the **FREEZE** control.
3. Press the **ADV MEAS** control. The **Meas Tools** menu appears.
4. Select **% Diam Red**. A prompt appears above the 2D image: "% Diameter Reduction: Measure inner and outer diameters."
5. Press the **DISTANCE** control. A cursor appears.
6. Position the cursor on the outer vessel wall at the maximum diameter of the vessel under study ([Figure 6-29](#)).
7. Press the **SELECT** control. A second cursor appears.
8. Position the cursor on the outer vessel wall opposite the location of the initial cursor (step 7).
9. Press the **SELECT** control to alternate between the two cursors, and use the trackball to adjust your measurement.
10. Press the **DISTANCE** control. A measurement cursor appears.
11. Position the cursor on the inner vessel wall at the minimum diameter of the vessel under study ([Figure 6-29](#)).
12. Press the **SELECT** control. Another measurement cursor appears.
13. Position the cursor on the inner vessel wall opposite the location of the initial cursor (step 12).
14. Press the **SELECT** control to alternate between the two cursors, and use the trackball to adjust your measurement. The values for the maximum diameter, the minimum diameter, and the diameter reduction are displayed in the results ([Figure 6-29](#)).

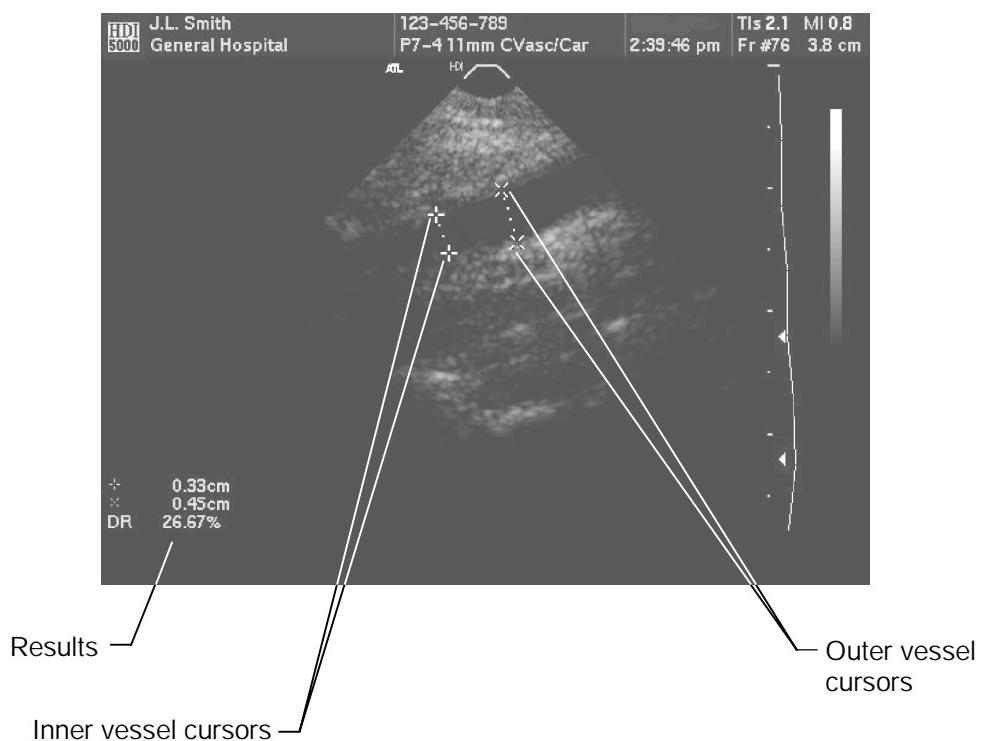


Figure 6-29. % Diameter Reduction

Making Measurements

- " To obtain the percent area reduction:

1. Obtain a 2D image that displays a cross-sectional view of the vasculature under study.
2. Press the **FREEZE** control.
3. Press the **ADV MEAS** control. The **Meas Tools** menu appears.
4. Select **% Area Red**. A prompt appears above the 2D image: "% Area Reduction: Measure inner and outer areas." The ellipse measurement method is the default measurement method for the first measurement, continuous trace is the default measurement method for the second measurement.
5. Press the **AREA** control. To measure the maximum area of the vessel, use the track-ball to position the cursor on the outer vessel wall at the maximum area of the vessel under study (Figure 6-30).

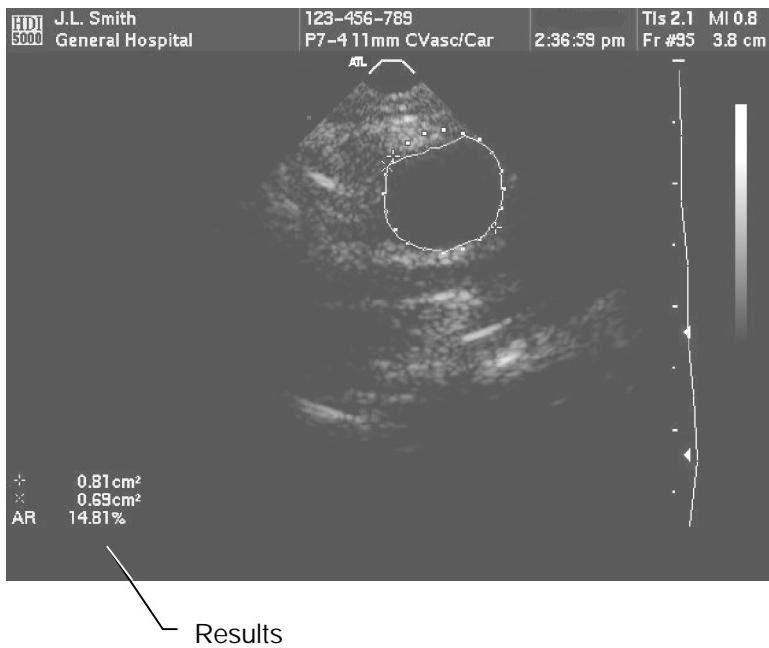


Figure 6-30. % Area Reduction

6. Press the **SELECT** control as required to adjust the size and location of the ellipse. The results display the maximum area.
7. Press the **AREA** control, as necessary, to begin the second area measurement with the continuous trace area method. (The continuous trace method is recommended for irregular plaque formations.)
8. To measure the minimum area of the vessel, position the cursor on the inner vessel wall at the minimum area of the vessel under study.

Making Measurements

9. Press the **SELECT** control to fix the initial cursor position.
10. Move the cursor along the inner vessel surface at the minimum area of the vessel.
11. Finish the trace at a position near the initial cursor.
12. Press the **AREA** control to end the measurement. The results now display the maximum area, the minimum area, and the percent of area reduction.

Using CALCS

This section describes how to use calculations (CALCS) menus and protocols. Additional instructions are included for protocols requiring them. Storing measurements in protocols ensures that your measurements and the calculations derived from them are included in the patient report.

The *Reference Manual* covers user-definable analysis, which provides you the capability to create your own measurements, calculations, and protocols. The *Reference Manual* also lists the sources from which the system measurements and calculations are derived.

Entering Measurements into Protocols

- " To display a CALCS menu:
 - Press the **CALCS** control to display the **CALCS** menu, the content of which is determined by the active Tissue Specific preset. Figure 7-1 shows two typical **CALCS** menus.
 - To remove the **CALCS** menu, select **Close**, or press the **CALCS** control.

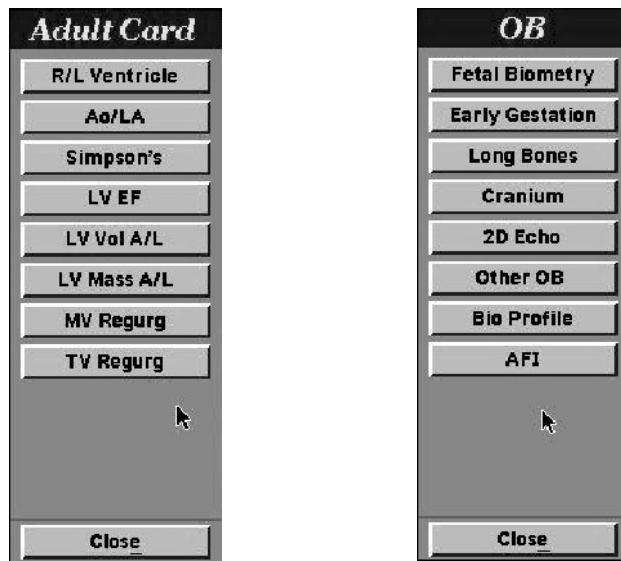


Figure 7-1. Examples of CALCS Menus

Using CALCS

- " To display a measurement protocol:

1. On the **CALCS** menu, select the desired protocol. A protocol is displayed (Figure 7-2 and [Figure 7-3](#)).
 2. To remove a protocol, press the **CALCS** control.
-

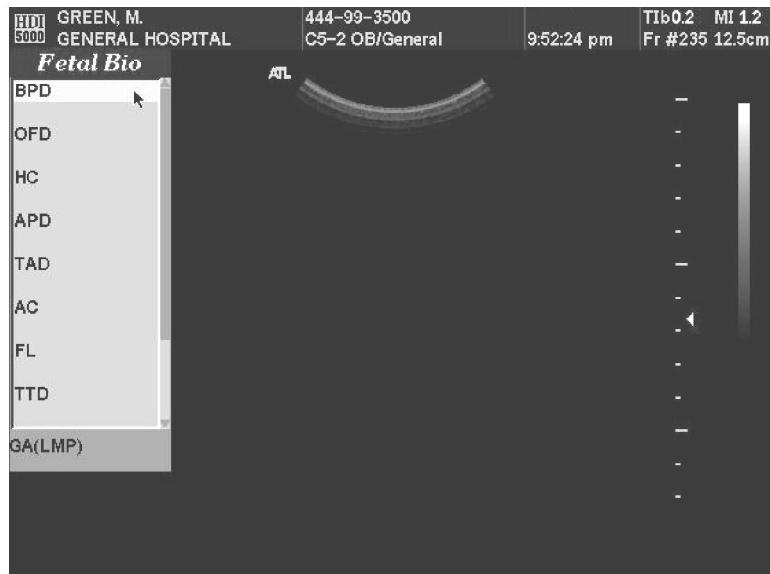


Figure 7-2. OB Protocol: Fetal Biometry



Figure 7-3. Cardiology Protocol: R/L Ventricle

Using CALCS

" To enter measurement data into a protocol:

1. Perform the measurement. You must freeze the display before you can enter measurements into the protocol.
 2. Press the **CALCS** control to display the CALCS menu.
 3. Select the desired protocol name to display the protocol.
 4. On the protocol, select the measurement label to enter the measurement value into the protocol (Figure 7-4).
 5. Press the **CALCS** control to remove the protocol.
-

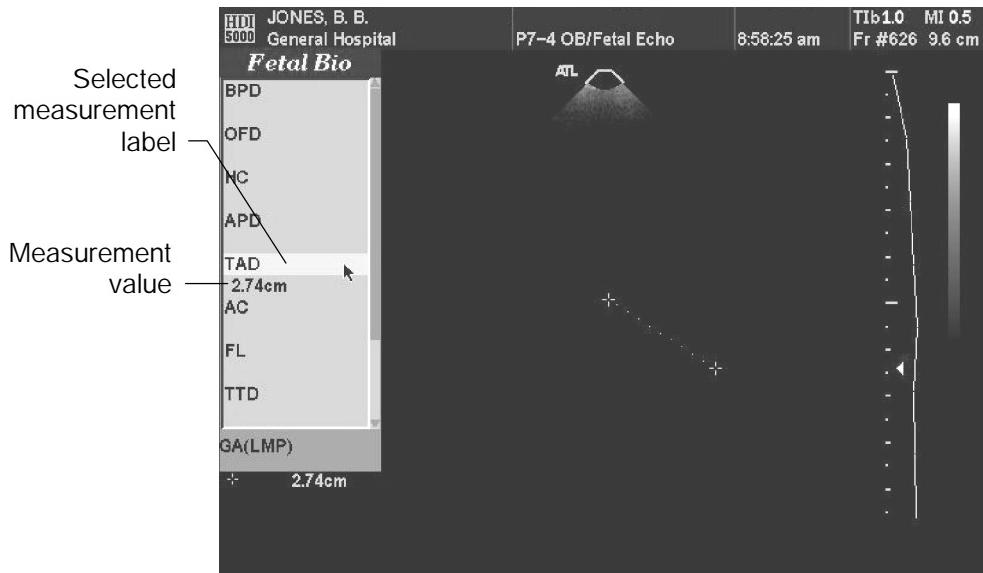


Figure 7-4. Entering Measurement Values

- " To create a new (user-defined) measurement label:

1. Perform the measurement, or create the new measurement label before performing the measurement. You must freeze the display before you can enter measurements into the protocol under the new measurement label.
2. Press the **CALCS** control to display the **CALCS** menu.
3. Select the desired protocol.
4. On the protocol, select **NEW**. (You may need to use the trackball to scroll down the protocol.) The **New Measurement** dialog box appears (Figure 7-5).
5. Use the keyboard to enter a measurement label into the dialog box. The measurement label field consists of a maximum of five characters.
6. Select **Accept** or **Cancel**.

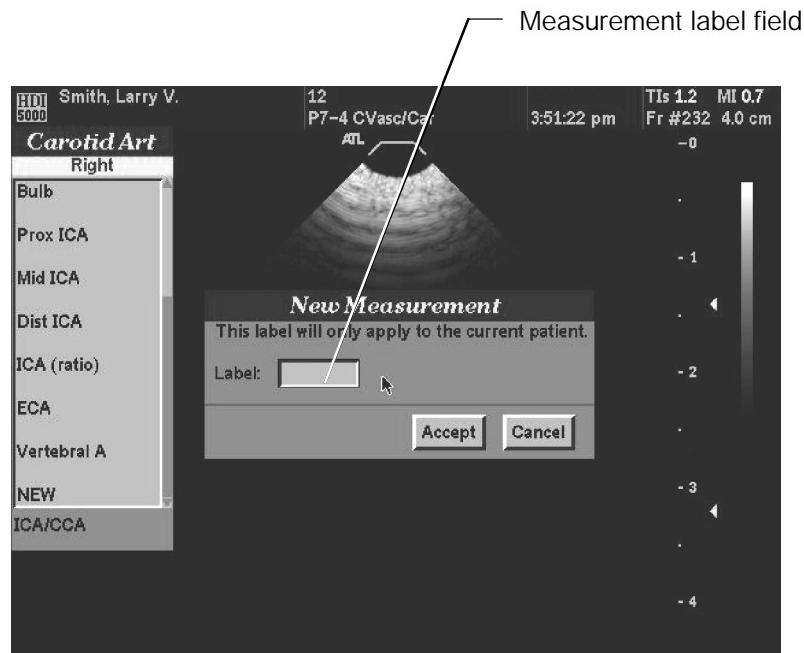


Figure 7-5. Creating a New (User-Defined) Measurement Label

- " To delete a user-defined measurement:

1. Press the **CALCS** control. The **CALCS** menu appears.
2. Select the desired protocol.
3. Delete any measurement values stored under the user-defined measurement label.
 - a. On the protocol, use the trackball to highlight the user-defined measurement label.
 - b. Press the **DEL MEAS** control. The last measurement value stored under this user-defined measurement label is deleted from the protocol.
 - c. Press the **CALCS** control. The user-defined measurement label is highlighted.
 - d. Repeat steps b and c, as necessary, to delete the measurement values.
4. Once the measurement values are deleted, the measurement label can be deleted. Press the **CALCS** control. The user-defined measurement label is highlighted.
5. Press the **DEL MEAS** control. A dialog box appears (Figure 7-6).
6. Select **Delete**, if you want to permanently delete the measurement label from the protocol; or select **Cancel**, if you do not want to delete the measurement label from the protocol.

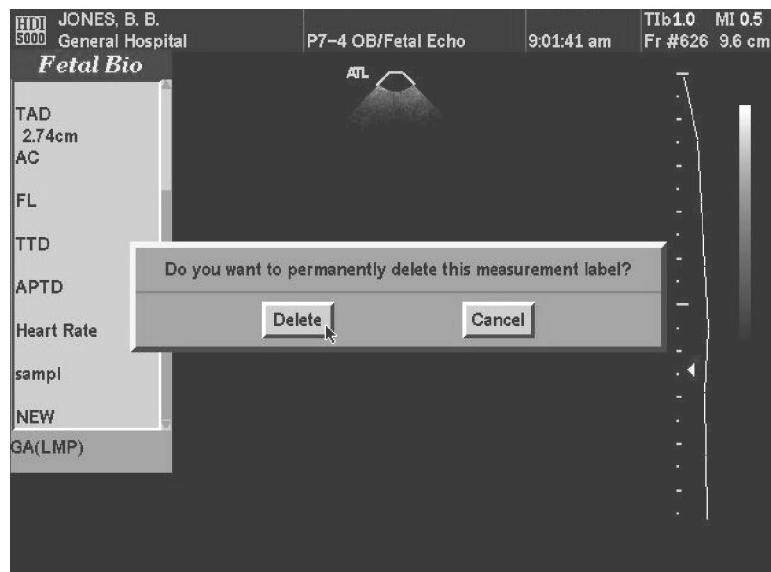


Figure 7-6. Deleting a New (User-Defined) Measurement

Using CALCS

- " To delete measurement values from a protocol:
 1. Ensure that the protocol is displayed. (Press the **CALCS** control.)
 2. Select the measurement on the protocol that you want to delete.
 3. Press the **DEL MEAS** control to delete the measurement value.

Using the Fetal Biometry Protocol

- " To automatically calculate HC from BPD and OFD measurements:
 1. Perform the individual measurements for BPD and OFD.
 2. Enter the measurement values for BPD and OFD into the protocol. (Using the **AREA** control to measure HC will override the automatic calculation of HC from BPD and OFD.)
 3. Press the **SELECT** control. The HC value is calculated from the BPD and OFD measurement values and displayed in the **Fetal Biometry** protocol.
- " To automatically calculate AC from APD and TAD measurements:
 1. Perform the individual measurements for APD and TAD.
 2. Enter the measurement values for APD and TAD into the protocol. (Using the **AREA** control to measure AC will override the automatic calculation of AC from APD and TAD.)
 3. Press the **SELECT** control. The AC value is calculated from the APD and TAD measurement values and displayed in the **Fetal Biometry** protocol.

Using the Breast Protocol for the Advanced Breast Imaging Clinical Option

The advanced breast imaging clinical option provides a **Breast** protocol and a breast body marker. The **Breast** protocol includes length, width, and height measurements for six lesions. The **Breast** protocol also provides a lesion-location function, with which you can position a numbered marker representing a lesion on the breast body marker. The patient report includes your measurements and the right and left body markers with lesion locations.

- " To display the **Breast** protocol:

1. Press the **CALCS** control to display the **Breast** menu (Figure 7-7).
-

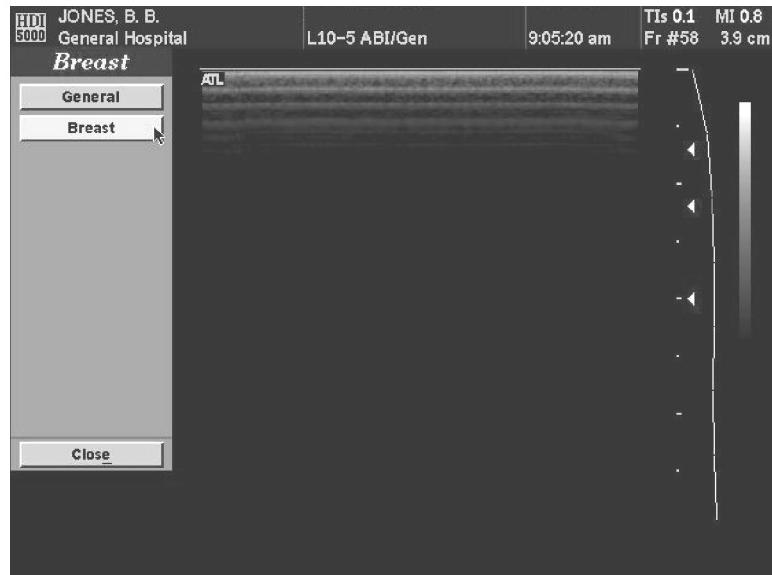


Figure 7-7. Breast Menu

2. Select **Breast**. The **Breast** protocol appears (Figure 7-8).



Figure 7-8. Breast Protocol

" To select the left or right side:

1. Display the **Breast** protocol as described in "[To display the Breast protocol.](#)"
 2. Use the trackball to highlight **Side (R/L)**.
 3. Press the **SELECT** control to select the side you want. An **L** or **R** appears in the protocol, and the left or right breast body marker appears on the display each time you press the **SELECT** control (Figure 7-9).
-



Figure 7-9. Breast Body Marker Side R and Side L

Using CALCS

" To locate a lesion on the body marker:

1. Display the **Breast** protocol as described in "[To display the Breast protocol.](#)"
 2. Select the side as described in "[To select the left or right side.](#)"
 3. Select **Lesion Location** (Figure 7-10) to display the first lesion marker ([Figure 7-11](#)).
 4. Use the trackball to move the lesion marker to the location on the breast body marker that corresponds to the lesion location.
 5. Press the **SELECT** control to fix the lesion marker in the lesion location.
 6. To adjust the lesion location on the body marker, press the **CALCS** control, and repeat steps 3 through 6.
-

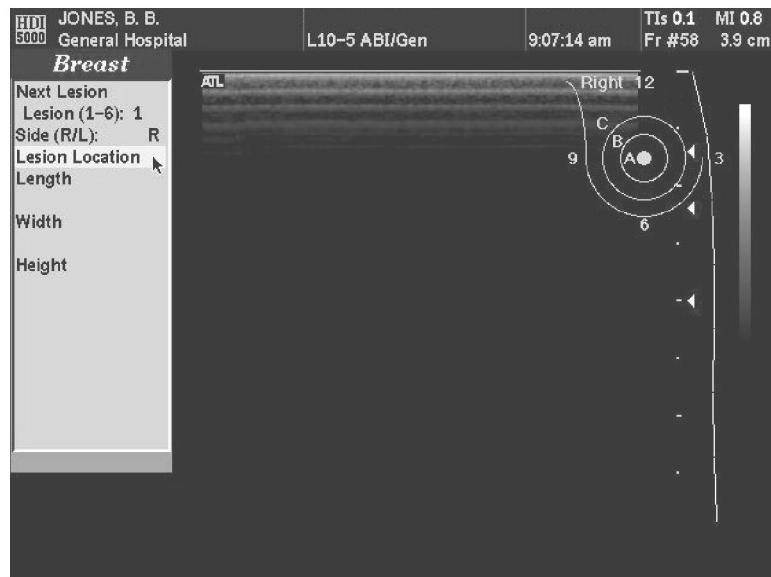


Figure 7-10. Lesion Location

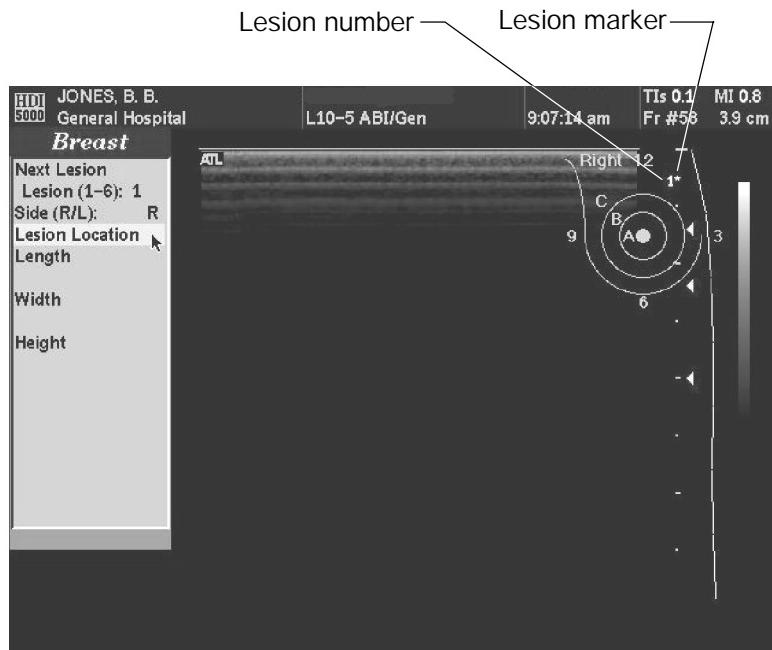


Figure 7-11. Positioning the Breast Lesion Marker

- " To measure a breast lesion:
 1. Scan the breast to display the lesion.
 2. Press the **FREEZE** control.
 3. Display the **Breast** protocol as described in "[To display the Breast protocol](#)."
 4. Select the side as described in "[To select the left or right side](#)."
 5. Locate the lesion location on the body marker as described in "[To locate a lesion on the body marker](#)."
 6. Press the **DISTANCE** control to display a cursor.

Using CALCS

7. Use the trackball to position the first cursor on the lesion (Figure 7-12).
 8. Press the **SELECT** control to display a second cursor.
 9. Use the trackball to position the second cursor on the lesion (Figure 7-12).
 10. Press the **SELECT** control to alternate between the two cursors to adjust the measurement.
- " To enter a breast lesion measurement into the protocol:
1. Perform the breast lesion measurement as described in "[To measure a breast lesion](#)."
 2. Press the **CALCS** control.
 3. Select **Length**, **Width**, or **Height**. to display the measurement in the **Breast** protocol (Figure 7-12).

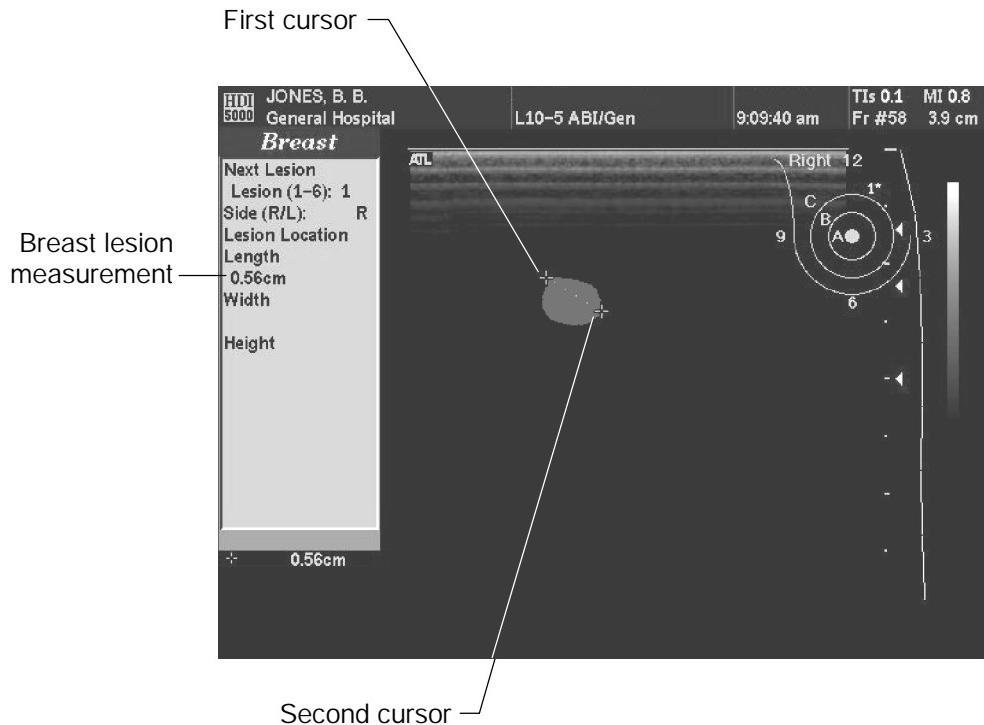


Figure 7-12. Measuring a Breast Lesion

Using the Cardiology Measurement Protocols

The cardiology measurement protocols are divided into 2D, M-mode, and Doppler protocols.

2D Imaging Cardiology Protocols

The 2D imaging cardiology measurements are, in general, intended to be used within the context of a 2D cardiology protocol. There are some 2D cardiology measurements that can be performed and then stored in the 2D cardiology protocol; but in general, you must first initiate the 2D cardiology protocol and follow the prompts on the display to automatically store the measurements in the 2D cardiology protocol.

Using Cineloop review to perform the following procedures allows you to store in system memory the necessary diastolic and systolic images required for the measurements. Once the sequence is in system memory, you can move through the Cineloop review sequence and measure the image as required, and then move on to the next image and measure it.

- " **To perform a 2D cardiology measurement:**
 1. Obtain the 2D image.
 2. Press the **FREEZE** control.
 3. Press the **CALCS** control to display the **Card** menu.
 4. Select the desired 2D protocol:
 - **R/L (Right/Left) Ventricle** protocol calculates results for ejection fraction (**EF**) and fractional shortening (**FS**).
 - **Ao/LA (Aorta/Left Atrium)** protocol calculates results for left atrium/aorta ratio.
 - **Simpson's** protocol calculates results for ejection fraction (**EF**), diastolic volume (**Dias Vol**), and systolic volume (**Sys Vol**).
 - **LV (Left Ventricle) EF** (Ejection Fraction) protocol calculates results for left ventricular ejection fraction, fractional shortening (**FS**), diastolic volume (**Dias Vol**), and Systolic Volume (**Sys Vol**).
 - **LV Vol (Volume) A/L (Area/Length)** protocol calculates results for left ventricular ejection fraction (**EF**).
 - **LV Mass A/L** protocol calculates results for left ventricular mass.
 - **MV (Mitral Valve) Regurg** (Regurgitation) protocol uses Color and Doppler imaging to calculate results for MV area, regurgitant flow rate, effective regurgitant orifice (ERO), and regurgitant volume.

Using CALCS

- **TV** (Tricuspid Valve) **Regurg** protocol uses Color and Doppler imaging to calculate results for RVSP (Right Ventricular Systolic Pressure), TV area, regurgitant flow rate, ERO, and regurgitant volume.
 - 5. Select the measurement. Follow the prompts on the display to perform the required measurement. The calculated results appear at the bottom of the 2D cardiology protocol. Additional calculations may appear in the patient report. See the "References" section in the *Reference Manual* for more information.
- " **To perform a heart rate measurement for the 2D cardiology protocols:**
1. Obtain the ECG trace that is concurrent with the 2D images used for the 2D cardiology protocol. (Cineloop review can be used.)
 2. Press the **FREEZE** control.
 3. Press the **CALCS** control. The **Card** menu appears.
 4. Select the desired 2D protocol. The 2D protocol appears.
 5. Select **Heart Rate**, or use the **Heart Rate** measurement tool (see "[To measure the heart rate](#)" in the "[Making Measurements](#)" section). Follow the prompts on the display to perform the measurement.

M-Mode Imaging Cardiology Protocols

The M-mode imaging cardiology measurements are, in general, intended to be used within the context of an M-mode cardiology protocol. All of the M-mode cardiology measurements, except All Points can be performed first and then stored in the M-mode cardiology protocol. With All Points, you must first initiate the M-mode cardiology protocol and follow the prompts on the display to automatically store the measurements in the M-mode cardiology protocol.

- " **To perform an M-mode cardiology measurement:**
1. Obtain the M-mode image.
 2. Press the **FREEZE** control.
 3. Press the **CALCS** control to display the **Card** menu.
 4. Select the desired M-mode protocol:
 - **R/L Ventricle** protocol calculates results for ejection fraction (**EF**), fractional shortening (**FS**), and **LV mass**.
 - **Mitral Valve** protocol calculates results for **D-E slope**.
 - **Ao/LA** protocol calculates results for **LV PEP/ET** (Pre-Ejection Period/Ejection Time) and **LA/Ao** ratio.
 - **Tricuspid Valve** protocol calculates results for **D-E slope**.
 - **Pulmonic Valve** protocol calculates results for **PEP/ET** ratio.

5. Select the measurement. Follow the prompts on the display to perform the required measurements. The calculated results appear at the bottom of the M-mode cardiology protocol. Additional calculations may appear in the patient report. See the "References" section in the *Reference Manual* for more information.

Doppler Imaging Cardiology Protocols

The Doppler imaging cardiology measurements are, in general, intended to be used within the context of a Doppler cardiology protocol. You follow the prompts and enter the measurement values into the protocol. All of the Doppler cardiology measurements, however, can be performed first and then stored in the Doppler cardiology protocol.

- " **To perform a Doppler cardiology measurement:**
 1. Obtain the Doppler display.
 2. Press the **FREEZE** control.
 3. Press the **CALCS** control to display the **Card** menu.
 4. Select the desired Doppler protocol:
 - **Pulmonic Valve** protocol calculates results for peak gradient and acceleration time.
 - **Mitral Valve Inflow** protocol calculates results for peak velocity, peak gradient, E/A ratio, mitral valve area, and acceleration time.
 - **MV (Mitral Valve) Regurg** (Regurgitation) protocol uses Color and Doppler imaging to calculate results for MV area, regurgitant flow rate, effective regurgitant orifice (ERO), and regurgitant volume.
 - **LVOT** (Left Ventricular Outflow Tract) protocol calculates results for LVOT diameter, peak gradient, and aortic valve area.
 - **Aortic Valve** protocol calculates results for LVOT diameter, peak gradient, and aortic valve area.
 - **Aortic Valve Regurgitation** protocol calculates and displays pressure half-time.
 - **Tricuspid Inflow** protocol calculates results for peak velocity, peak gradient, E/A ratio, and acceleration time.
 - **TV (Tricuspid Valve) Regurg** protocol uses Color and Doppler imaging to calculate results for RVSP (Right Ventricular Systolic Pressure), TV area, regurgitant flow rate, ERO, and regurgitant volume.
 - **Pulmonic Veins** protocol calculates results for systole/diastole ratio.
 - **Cardiac Output and Qp:Qs** (Shunt Ratio) protocol calculates results for cardiac output at systole and diastole, stroke volume at systole and diastole, and Qp:Qs ratio.
 - **TDI** (Tissue Doppler Imaging) protocol calculates E/A ratio.

Using CALCS

5. Select the measurement. Follow the prompts on the display to perform the required measurements. The calculated results appear at the bottom of the Doppler cardiology protocol. Additional calculations may appear in the patient report. See the "References" section of the *Reference Manual* for more information.

Using Patient Reports

" To display a report:

1. Press the **Report** key. The patient report opens at the page that corresponds to the currently active protocol. A specific report will consist of only those parts for which you have stored measurements.
2. To move through the report, select from among the options at the bottom of the report pages:
 - **Final Report** or **Edit**: Toggles between these two selections. **Final Report** shows what will be printed ([Figure 8-1](#)), and **Edit** allows you to use the trackball and keyboard to edit the report ([Figure 8-2](#)).
 - **Close**: Closes the report. You can also press the **Report** key.
 - **Graphs**: Displays the OB graphs.
 - **Print**: Prints the patient report and the OB graphs to the report printer. The **Print** selection will only be available if you have set the **Serial Output Port** setup to **Okidata Printer** in the **Peripherals** setups.
 - **Data Transfer**: Initiates a serial data transfer of all measurement data to the serial device connected to the system serial output port. The **Data Transfer** selection will only be available if you have selected it in the **Peripherals** setups.
 - **Arrows**: Select the right arrow to move forward through the report; select the left arrow to move back through the report.
 - **Page keys**: These keys can be used to move through the report screens.

Using Patient Reports

Final Patient Report

J.L. Smith	123-456-789	General Hospital				
OB						
AUA:	14w5d	EDD(AUA): 10/08/98				
GA(LMP):	13w1d	EDD(LMP): 10/19/98				
LMP:	01/12/98	Estab. Due Date: 10/15/98				
CI:	104 % (0.97 - 1.31)	BPDA: 2.40 cm 14w1d				
Fetal Bio						
BPD	Hadlock	2.75	2.75	cm	15w0d	[13w5d-16w2d]
OFD		2.65	2.65	cm		
HC	Hadlock	8.48c	8.48	cm	13w6d	[12w4d-15w1d]
APD		2.79	2.79	cm		
TAD		2.79	2.79	cm		
AC	Hadlock	8.77c	8.77	cm	15w1d	[13w3d-16w6d]
Early Gest						
CRL	Hadlock	8.88	8.88	cm	14w6d	
Gest Sac	Nyberg	8.88	8.88	cm	---	
Yolk Sac		9.00	9.00	cm		

Edit Graphs Close ← 1 of 2 →

Final Patient Report

J.L. Smith	123-456-789	General Hospital
GYN/FERT		
LMP:	01/12/98	Age: 24
Uterus		
Length	6.63	cm
Height	5.94	cm
Width	2.63	cm
Endo Thick	4.20	cm
Volume	54.23	cc
Left Ovary		
Length	3.14	cm
Height	3.14	cm
Width	1.72	cm
Volume	8.88	cc
Right Ovary		
Length	4.12	cm
Height	3.82	cm
Width	1.91	cm
Volume	15.74	cc

Edit Graphs Close ← 2 of 2 →

Figure 8-1. Patient Report: Final

Using Patient Reports

Patient Report - Edit Screen

J.L. Smith	123-456-789	General Hospital	
OB			
AUA: GA(LMP): LMP:	14w5d 13w1d 01/12/98	EDD(AUA): EDD(LMP): Estab. Due Date:	10/08/98 10/19/98 10/15/98
CI: HC/AC: FL/BPD: FL/AC:	104 % 0.97 % %	BPDA:	2.40 cm 14w1d
Gravida: <input type="text"/> Para: <input type="text"/> Aborta: <input type="text"/>			
Fetal Bio			
BPD	Hadlock	2.75 2.65 8.48c 2.79 2.79 8.77 FL	cm 15w0d [13w5d-16w2d] cm cm 13w6d [12w4d-15w1d] cm cm cm 15w1d [13w3d-16w6d] cm
<input type="button" value="Final Report"/> <input type="button" value="Graphs"/> <input type="button" value="Close"/>		1 of 8	

Figure 8-2. Edit Screen

Using Patient Reports

- " To enter comments into the report:
 1. Press the **Report** key.
 2. If necessary, select **Edit** to display the **Patient Report-Edit Screen**.
 3. Move the cursor to the right arrow.
 4. Press the **SELECT** control to page through the report until you see the **Comments** field (Figure 8-3). (You can also use the **Page** keys.)
 5. Move the cursor to the **Comments** field.
 6. Use the keyboard to type in comments. (Use the **Return** key to start a new line of text.)
-

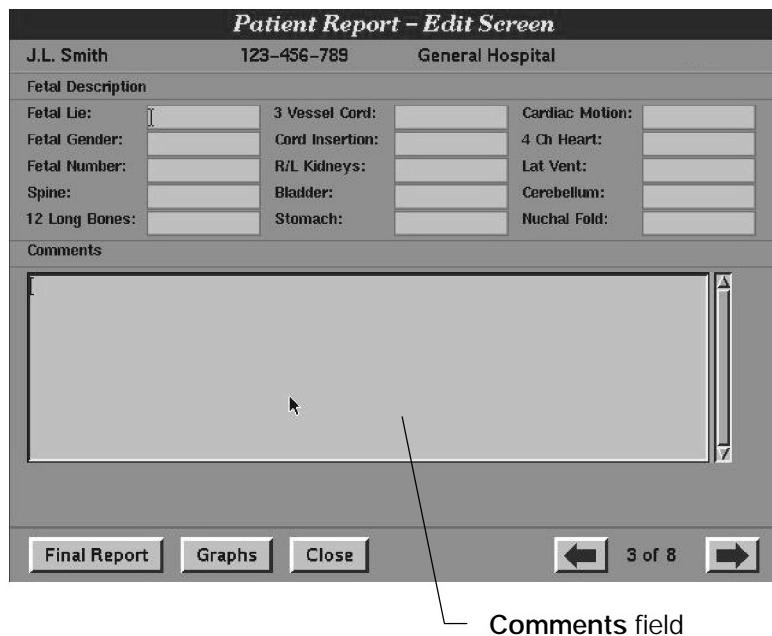


Figure 8-3. Entering Comments in the Patient Report-Edit Screen

Using Patient Reports

" To edit the patient report:

1. Press the **Report** key.
2. If necessary, select **Edit** to display the **Patient Report-Edit Screen**.
3. Use the trackball to move the cursor to the text that you want to edit. (Refer to the "Calculations" section of the *Reference Manual* for information on what parts of the report can be edited.)
4. Press the **SELECT** control to display a dialog box (Figure 8-4).
5. Use the keyboard to edit the patient report.
6. Select **Accept**, **Delete**, or **Cancel**.
 - If you accept the measurement, then the measurement value is bracketed.
 - If you delete the measurement, then the measurement is deleted from the patient report.
 - If you cancel the edit, the dialog box is removed, and the report is unaffected.

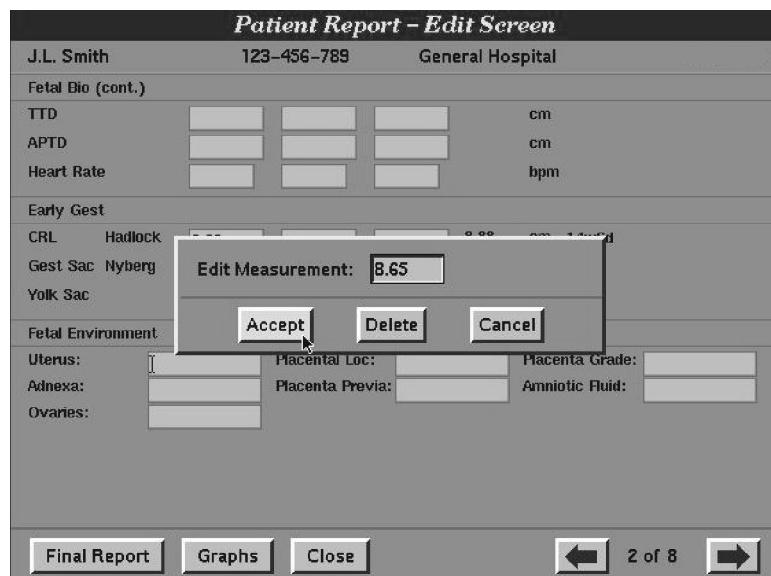


Figure 8-4. Editing the Report

Using Patient Reports

- To display a graph from a current OB exam:

Note Ensure that you have performed and entered current measurements and that you have selected the correct **OB Calculations** setups. **Study Data** must also include the LMP and established due date.

- Press the **Report** key.
 - Select **Graphs** at the bottom of the display (Figure 8-5) to display the **OB Graphs**.
-

Patient Report - Edit Screen

J.L. Smith	123-456-789	General Hospital				
Fetal Bio (cont.)						
TTD	<input type="text"/>	<input type="text"/>	<input type="text"/>	cm		
APTD	<input type="text"/>	<input type="text"/>	<input type="text"/>	cm		
Heart Rate	<input type="text"/>	<input type="text"/>	<input type="text"/>	bpm		
Early Gest						
CRL	Hadlock	8.88	8.88	cm 14w6d		
Gest Sac	Nyberg	[8.65]	8.65	cm ---		
Yolk Sac		9.00	9.00	cm		
Fetal Environment						
Uterus:	<input type="text"/>	Placental Loc:	<input type="text"/>	Placenta Grade:	<input type="text"/>	
Adnexa:	<input type="text"/>	Placenta Previa:	<input type="text"/>	Amniotic Fluid:	<input type="text"/>	
Ovaries:	<input type="text"/>					
Final Report		Graphs	Close	◀	2 of 8	▶

Figure 8-5. Graphs Selection on the Patient Report

- Select **Established Due Date** or **LMP** to display the graph for **EDD** or **LMP** (Figure 8-6).
- To display the graph for a different measurement or investigator, see “[To select an OB graph](#).”

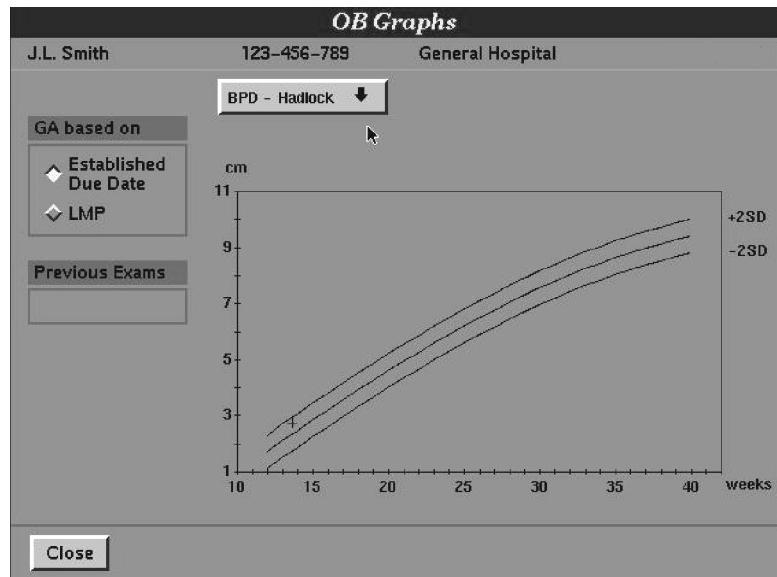


Figure 8-6. OB Graphs Display

- " To select an OB graph:

1. Use the trackball to move the cursor to the arrow next to the name of the currently displayed investigator's graphs on the **OB Graphs** display.
2. Press the **SELECT** control to display a list of the available measurements and investigators (Figure 8-7).

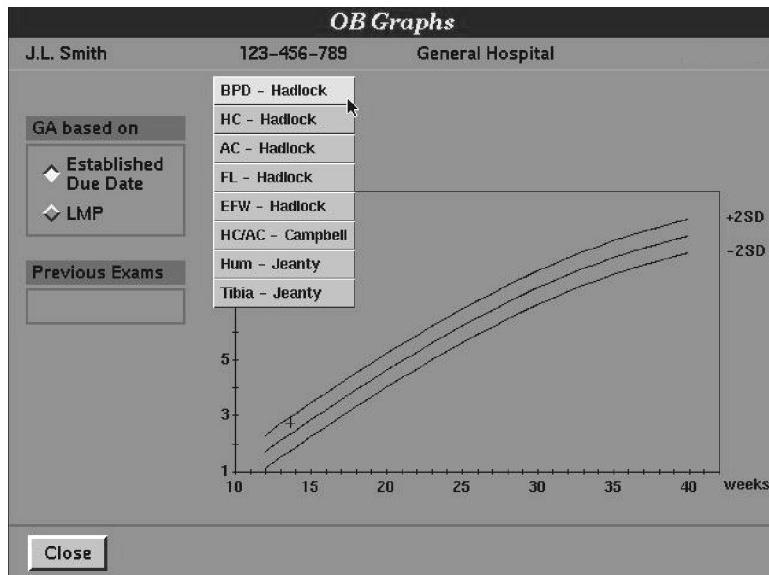


Figure 8-7. Selecting a Different Measurement or Investigator for the OB Graph

3. Select the measurement and investigator that you want to appear on the graph. The investigator's graphs appear on the display, and the measurement point is located on the graph (Figure 8-8).

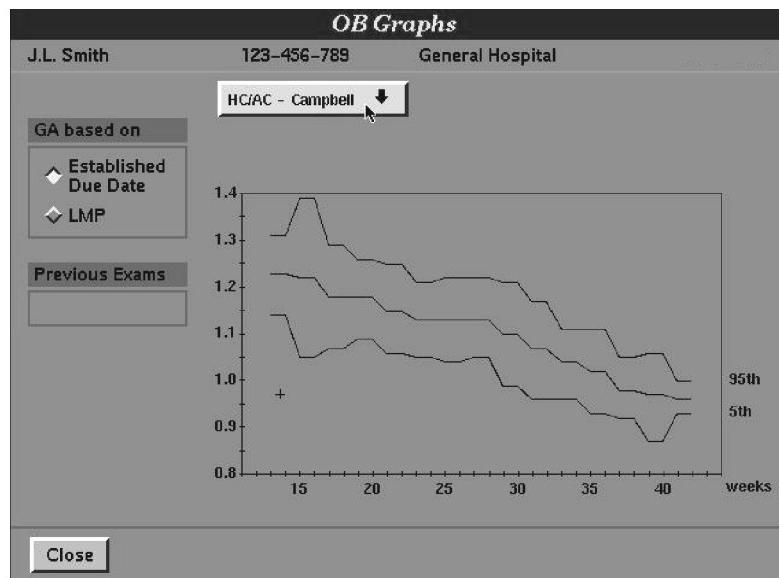


Figure 8-8. OB Graphs

Using Patient Reports

- " To print OB graphs:

On the **OB Graphs** display, select **Print** (Figure 8-9). The report printer prints the displayed OB graph.

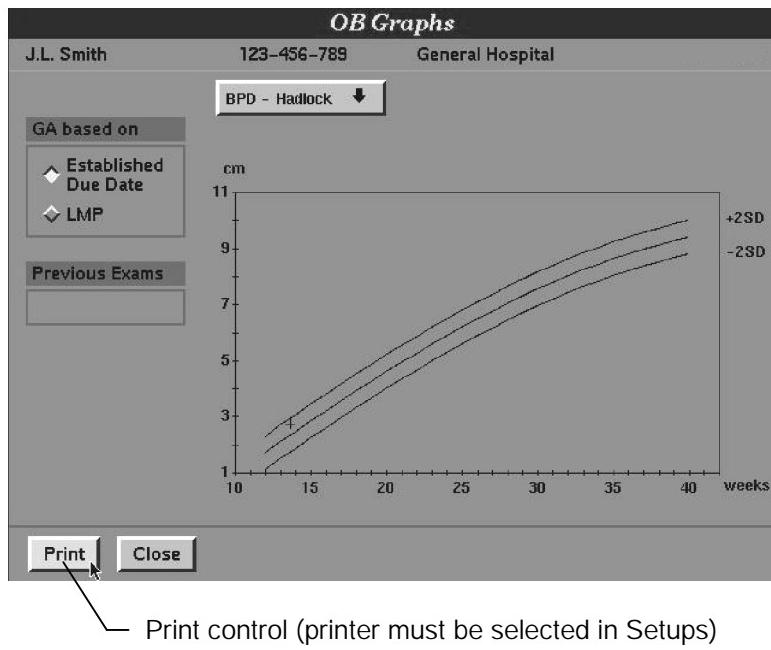


Figure 8-9. Printing OB Graphs

Using Patient Reports

- " **To transfer patient data on the serial output port:**

The data transfer feature provides a report format that can help you make use of a computer or off-line analysis system.

1. Ensure that your serial device is properly connected to the serial output port.
2. Ensure that in the **Peripherals** setups, **Serial Output Port** is set to **Data Transfer**:
 - a. Press the **Setups** key. The **Directory of Setup Options** appears.
 - b. Select **Peripherals**. The **Peripherals** setups appear.
 - c. Select **Data Transfer**.
 - d. Select **Close**.
3. Verify that a **Data Transfer** selection appears on the **Final Patient Report**:
 - a. Press the **Report** key. The **Final Patient Report** appears.
 - b. Verify that the **Data Transfer** selection is present at the bottom of the **Final Patient Report**.
 - c. Select **Close**.
4. Perform your measurements and enter them into the patient report.
5. Press the **Report** key. The **Final Patient Report** appears.
6. Select **Data Transfer**. Data transfer begins. The entire patient report is spooled to the serial output port. By definition, spooling occurs in the background and is transparent to other system operations. You can proceed with scanning. For more information about data transfer, refer to the "Calculations" section of the *Reference Manual*.

Printing and Recording

This section pertains to the hardcopy devices that can be used with the system: printers, cameras, and recorders. The information covers basic operation: loading film, ultrasound system setup, printing, and recording. For detailed information on hardcopy devices installed or connected to your ultrasound system, refer to the "Printing and Recording" section of the *Reference Manual* for system information and the hardcopy device manufacturer's instructions for information on the hardcopy device.

Printing

If you have the Image Management option or the Digital Video Streaming (DVS) option, your printer setup may differ from the following procedure. Refer to the "Image Management" or the "Digital Video Streaming Option" sections of the *Reference Manual* for printing setup.

- " **To prepare the system for operation with a hardcopy device:**
 1. Press the **Setups** key.
 2. On the **Directory of Setup Options**, select **Peripherals**. The **Peripherals** setups appear.
 3. Depending upon the configuration of the system:
 - If you have an internal printer: select the type of internal printer installed.
 - If you have an external printer connected to the On-Screen Programming (OSP) port: select **External Printer** listed under **OSP Input Port**.
 - If you have a device connected to the Serial Output Port: select the type of device listed under **Serial Output Port**.
 4. If you want to use the print footswitch, select **Print Control** under **Camera Footswitch**.
 5. Select **Close** to return to imaging. Now you are ready to display and print ultrasound images.

Multi-Image Camera

CAUTION The film cassette must be loaded in a darkroom using only a safety light.

" To load the cassette with film:

1. Pull the dark slide out of the film cassette and open the hinged flap ([Figure 9-1](#)).
2. Slide the film in under the two rail guides until it will go no further into the cassette.

Note *If a single-emulsion coated film is used, the emulsion side must face up in the cassette. The emulsion side has a dull finish and a notch coding. When the notch is in the upper right-hand corner of the cassette, the emulsion is face up.*

3. After the film is all the way in the film cassette, fold the hinged flap down and insert the dark slide.

" To load the multi-image camera with a film cassette:

1. After the 40-second warm-up, a soft tone indicates the camera is ready for operation.
2. Insert the loaded film cassette through the cassette entry slot on the front of the camera.
3. When the film cassette is nearly all the way in, apply downward pressure and continue inserting until the upper locking strip of the film cassette is secured against the inside upper lip of the entry slot.
4. After the film cassette is loaded into the camera, remove the dark slide located on the top half of the film cassette. The film cassette will then be pulled into the camera for the first exposure.

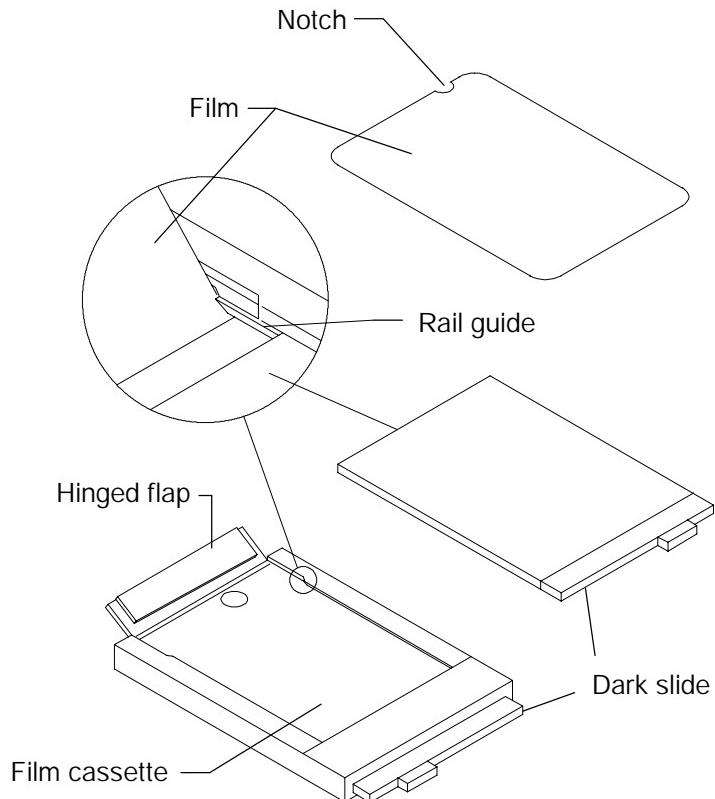


Figure 9-1. Loading the Film Cassette

Printing and Recording

- " To make exposures with the camera:
 1. Obtain the desired image.
 2. Press **FREEZE**.
 3. To print:
 - a. With an internal device, press the **PRINT** control on the system.
 - b. With an externally connected device, press the **PRINT** control on the camera.
 - c. With an internal device, press the print (left) footswitch. (Ensure that the **Camera Footswitch Control** setup is set for **Print Control**.)
 4. You can take six exposures with one film cassette before you must either replace it or turn the cassette over.
 5. Insert the dark slide, and then remove the cassette by pushing down on the center and pulling the cassette out.
 6. If you want to make six additional exposures, turn over the cassette, reinsert it into the camera, remove the dark slide, and repeat steps 1 through 3.
 7. Develop the film in a darkroom.

Black-and-White Printer

- " To print with the black-and-white printer:
 1. Obtain the desired image on the screen.
 2. Press the **FREEZE** control to freeze the image.
 3. To print:
 - a. With an internal device, press the **PRINT** control on the system.
 - b. With an externally connected device, press the **PRINT** control on the printer.
 - c. With an internal device, press the print (left) footswitch. (Ensure that the **Footswitch Control** setup is set for **Print Control**.)
 4. To remove the print, tear it up across the cutting bar.
 5. To make a copy of the last print, press **COPY** on the printer front panel.
 6. For information on print quality adjustment, refer to the printer manufacturer's instructions.

Color Printer

Some color printers allow multiple-print formats: for example, a four-on-one format. If you decide to use a multiple-print format, then the print will be available after the last print of the selected format. For example on a four-on-one format, the printer stores the first three images then prints all four images, when you press **PRINT** the fourth time.

- " **To print with the color printer:**
 1. Obtain the desired image on the screen.
 2. Press the **FREEZE** control to freeze the image.
 3. To print:
 - a. With an internal device, press the **PRINT** control on the system.
 - b. With an externally connected device, press the **PRINT** control on the printer.
 - c. With the footswitch, press the print (left) footswitch. (Ensure that the **Footswitch Control** setup is set for **Print Control**.)
 4. For information on color print quality adjustment, refer to the color printer manufacturer's instructions.

Recording

The information in this section is intended to help you with basic VCR operation related to recording, pause, and playback with the system. For detailed information about the VCR, refer to the VCR manufacturer's instructions.

A videotape may be inserted into the VCR anytime after the system has been turned on and initialization is complete.

- " **To prepare the system for operation with a VCR:**
 1. Press the **Setups** key.
 2. On the **Directory of Setup Options**, select **Peripherals**. The **Peripherals** setups appear.
 3. Depending upon the configuration of the system:
 - If you have an internal VCR: select the type of internal VCR installed. (An internal VCR is defined as a VCR that is internally connected to the system, not one that is connected to the rear panel.)
 - If you have a VCR connected to the S-Vid Input Port: select **VCR/SVHS** under **S-Vid Input Port**.
 - If you have a VCR connected to the COMP-Vid Input Port: select **VCR/VHS** under **COMP-VID Input Port**.

Printing and Recording

4. If you want to use the VCR footswitch, select **VCR Record Control** under **Camera Footswitch**.
5. Insert a videotape into the VCR. Now you are ready to record ultrasound images.

" **To record:**

1. Press the **RECORD** control on the system. The **RECORD** indicator on the system blinks for a while before recording begins. (To record with an external VCR use the VCR record controls and microphone.)
2. To add voice commentary to the videotape.
 - a. Press the **Microphone** key on the system to turn on the microphone. An icon will display on the lower right side of your monitor indicating that the microphone is on.
 - b. Speak into the system microphone, which is located on top of the monitor module.
3. To stop recording, do one of the following:
 - Press the system **RECORD** control. The VCR will pause. The system **RECORD** indicator blinks while the VCR is in pause.
 - On the VCR, press **STOP**, or press the softkey on the system.
 - On the VCR, press **PAUSE/STILL**, or press the softkey on the system.

Note *The Rewind (REW) and Fast Forward (FF) controls on the VCR, or the softkeys on the system, can be used to wind the videotape at fast speed.*

" **To record with the footswitch:**

1. Ensure that the footswitch control setup in the **Peripherals** setups is set for **VCR Record Control**.
2. Ensure that the footswitch is securely connected.
3. Press the record footswitch. (The record footswitch is the left footswitch in the footswitch assembly.)
4. To stop recording, press the record footswitch. Recording stops.

VCR Playback

You can play back VCR recordings on the internally connected VCR using either the controls on the VCR or by pressing **VCR CTRL** on the system and then using the VCR soft-keys ([Figure 9-2](#)).

" **To play back a VCR recording:**

1. Use the tape counter, **REWIND**, **FF** (fast forward), **PAUSE**, and **STOP** to find the section of the tape you want to play back.

2. Press **PLAY**.
-

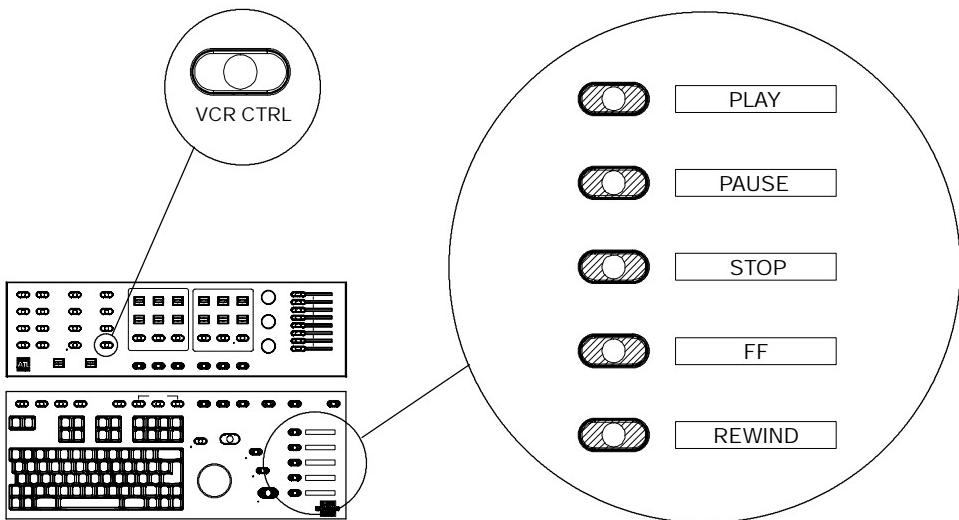


Figure 9-2. VCR Control with Softkeys

- " To freeze a frame during VCR playback:

Press the **FREEZE** control.

- " To play back a VCR recording with an externally connected VCR:

1. Ensure that the VCR is connected properly to the rear of the system.
2. On the **Directory of Setup Options**, select **Peripherals**. The **Peripherals** setups appear.
3. Depending on the configuration of your system, select the correct type of VCR and the correct input port:
 - VCR/SVHS at the S-VID Input Port
 - VCR/VHS at the COMP-VID Input Port.
4. Select **Close** to close setups.
5. Press **PLAY** on the VCR.
6. On the system keyboard, press the **Superkey** and the **Video** key. Release both keys. The video from the VCR plays back on the system monitor.
7. Use the VCR controls (tape counter, **REW**, **FF**, **PAUSE**, and **STOP**) to find the section on the tape that you want to play back.)
8. To start and stop the VCR playback, press **PLAY** and **STOP** on the VCR.

9. To return to normal system imaging, repeat [step 6](#)
- " **To use VCR playback-pause:**
 1. To pause VCR playback, press **PAUSE**.
 2. Press **PAUSE** again to return to VCR playback.
- " **To adjust color tint and intensity during VCR playback:**
 1. Rotate the **DOP GAIN** rotary control to vary the hue or tint of the VCR playback image: clockwise increases hue or tint and counterclockwise decreases the hue or tint.
 2. Rotate the **COL GAIN** rotary control to vary the saturation or intensity of the VCR playback image: clockwise increases saturation or intensity and counterclockwise decreases saturation or intensity.
- " **To remove the videotape cassette:**
 1. Press **REWIND** to rewind the videotape.
 2. Press **EJECT** on the VCR to eject the videotape cassette.
 3. When the videotape cassette has ejected completely, remove the cassette.
- " **To search a VCR tape:**
 1. During playback or recording, press **STOP**.
 2. Press the **Superkey** and the **Frame Counter** key at the same time. A dialog box appears on the screen ([Figure 9-3](#)).
 3. Use the keyboard to set the frame counter to the number of the desired frame.
 4. Select **Search Tape** on the dialog box. The VCR will search the tape for the selected frame, and enter Play/Pause when the frame has been reached.

Printing and Recording

- " To synchronize the system and the VCR frame counters:
 1. During playback, press **STOP**.
 2. Note the frame counter value on the VCR.
 3. Press the **Superkey** and the **Counter** key to display a dialog (Figure 9-3).
 4. Use the keyboard to set the frame counter to the value noted in step 2.
 5. Select **Set Counter** on the dialog. The VCR frame counter and the system frame counter now have the same value.
-

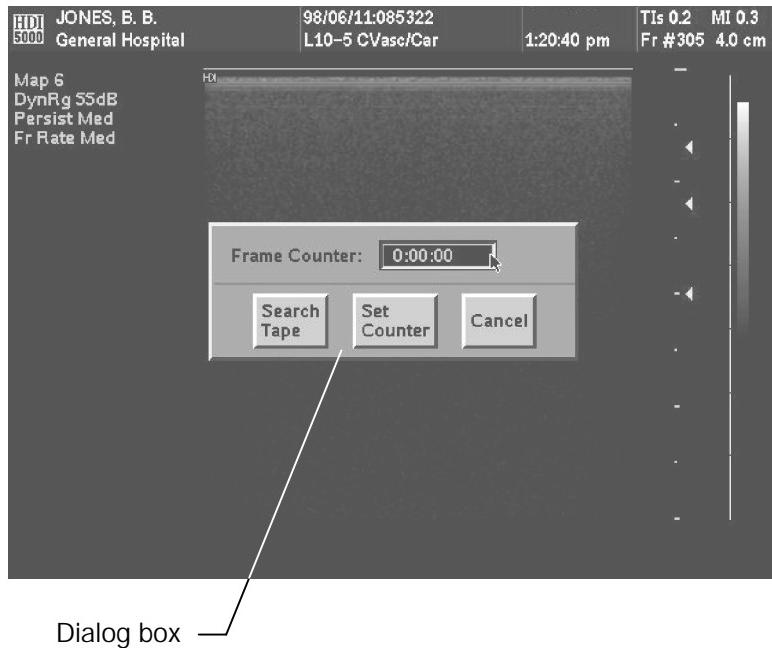


Figure 9-3. VCR Frame Counter

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